CD Jam

Software Requirements Specification

STORC Dashboard

CSc 190 – Spring 2015
5-8-2015

1. INTRODUCTION

This is the Software Requirements Specification document for the STORC Dashboard Project sponsored by Dr. Michael Christensen.

This project is being undertaken by the CD Jam development team. The team is comprised of undergraduate students majoring in Computer Science at California State University, Sacramento. The team members are enrolled in a two-semester senior project course required of all undergraduate majors. Successful delivery of the desired software product will fulfill the senior project requirement for the student team members.

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1.1 Purpose

The purpose of the Software Requirements Specification is to create an understanding between CD Jam and STORC with respect to the requirements and specifications of the STORC Dashboard Project. This document explains the features of the STORC Dashboard Project along with the users that will use the system and any constraints that CD Jam may encounter while creating this application.

1.2 Scope

The SRS includes formal requirements for the STORC Dashboard Project along with describing assumptions, constraints, and providing an overview of the context in which the system will operate. This documents will explain in depth how each of the requirements will be fulfilled while establishing a foundation for the STORC Dashboard Project.

1.3 Definitions, Acronyms, and Abbreviations

1.3.1 Definitions

Administrator: A super user that oversees other users and the projects within STORC.
Aquaponics: A cycle between hydroponically grown plants and aquatic animals, in which the waste produced from animals supplies nutrients for plants which in turn purifies the water.
Biodiesel: A substitute for diesel created by a biological chemical reaction.
Dashboard: A collection of data laid out in an easy to read format represented in a graphical format.
Photovoltaic Cell: A device that delivers an electric current as a result of a chemical reaction from the rays of the sun.
Principal Investigator: A user that in charge one or more STROC projects and oversees one or more STORC Technicians. Principal Investigators are most often faculty or staff members at CSUS.
Public: Any user that is not directly involved with STORC or STORC activities.
Technician: A user who works on a project overseen by a PI. This user generally monitors and collects data directly from one or more project stations. These are usually student volunteers.
Vermiculture: The cultivation of worms used for composting materials.
Webmaster: This user is in charge of maintaining and updating the default webpage and widgets for the STORC Dashboard Project.

1.3.2 Acronyms

CSc – Computer Science
CSUS – California State University, Sacramento
ECS – College of Engineering and Computer Science
ERD – Entity Relationship Diagram
GUI – Graphical User Interface
HTML – Hyper Text Markup Language
IRT – Information Resources and Technology
IT – Information Technology
MySQL – My Structured Query Language
PI – Principal Investigator

PMP – Software Project Management Plan
SDS – Software Design Specification
SRS – Software Requirements
STR – System Test Report
STORC – Sustainability Technology Optimization Research Center
STS - Software Test Specification
UM – User Manual
UML – Unified Modeling Language
WCM – Web Content Management

1.3.3 Abbreviations

Admin – Administrator
CSc 190: Computer Science Senior Project - Part 1
CSc 191: Computer Science Senior Project - Part 2
Tech - Technician

1.4 References

Buckley, Bob. *CSc 190-01 Senior Project: Part 1.* CSUS, Dec. 2014. Web. 22 February 2015. http://athena.ecs.csus.edu/~buckley/CSc190/CSc190.html

STORC. CSUS STORC. n.p. Web. 22 February 2015. http://www.csus.edu/storc/about.html

1.5 Overview of Contents of Document

Section 2: General Description, describes the STORC Dashboard's feature, users, constraints, and any assumptions CD Jam has made on the application. *Section 3: Specific Requirements,* discusses the technical information and data needed to design the STORC Dashboard. *Section 4: Approvals,* contains the signatures of CD Jam, faculty advisor, and sponsor. This section will only be signed when all parties agree on the terms and conditions of the Software Requirements Specifications. *Appendix A: Data Dictionary* defines the data elements, structures, and tables that will be used when creating the STORC Dashboard. *Appendix B: Use Case Models* will give an overview of the logic of the STORC Dashboards basic use cases.

2. GENERAL DESCRIPTION

2.1 Product Perspective

The STORC Dashboard Project will interact with sensors set up at each project at STORC. The sensors measure a variety of data that is transmitted over a Raspberry Pi to an IRT Server. The server will upload and store this data in a database that is provided by IRT. The STORC Dashboard Project will send queries to the database and the application will receive information back in order to display the data. If sensor or data errors occur, the STORC Dashboard Project will send alerts through CSUS's e-mail servers allowing the Project Sponsor, PI, and any other pertinent users to know that there is an issue with a specific STORC Project.

2.2 Use Case Models of the System's Features

Figure 1– Figure 7 are the use case models for the STORC Dashboard.

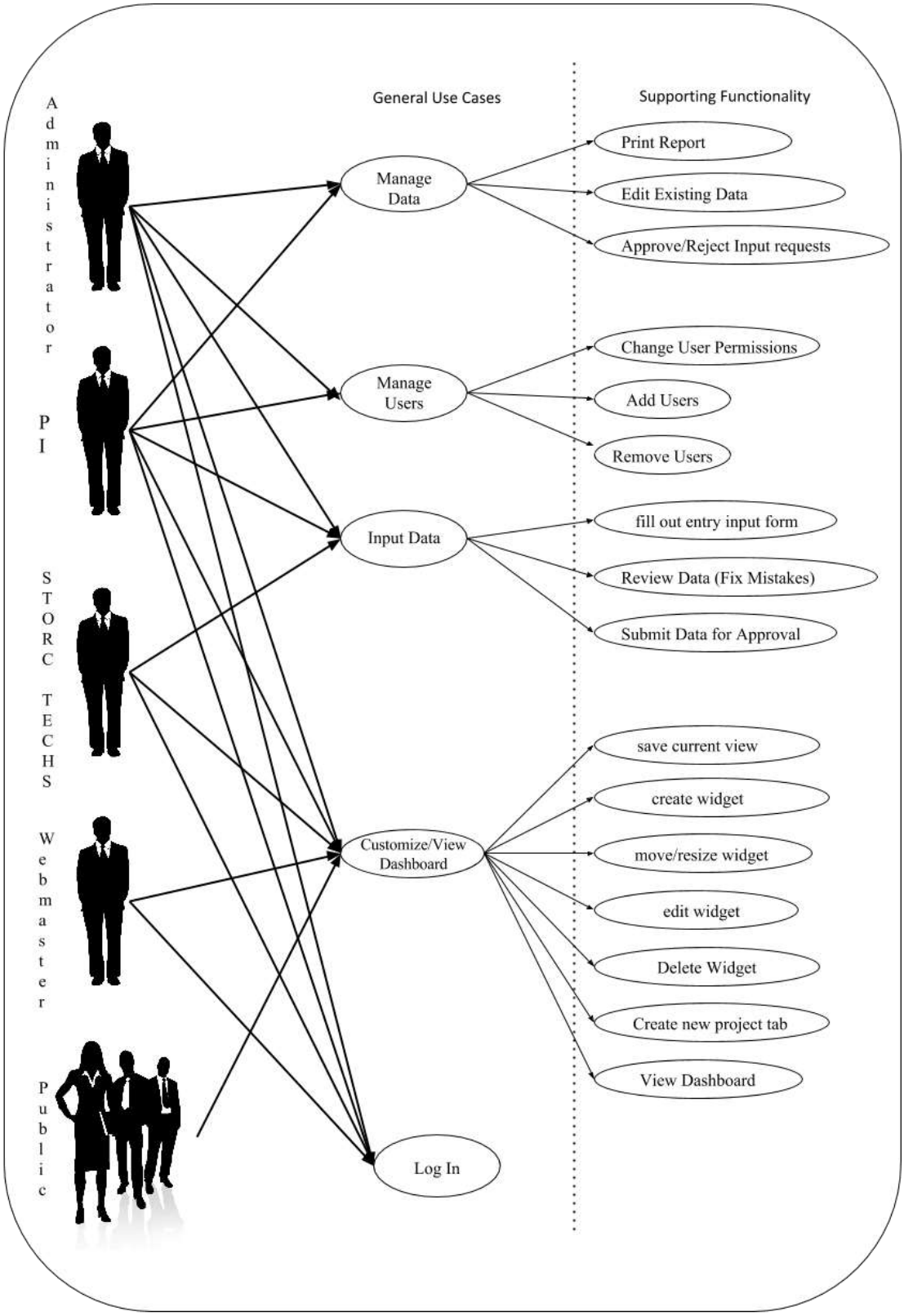

Figure 1: Expanded Use Cases

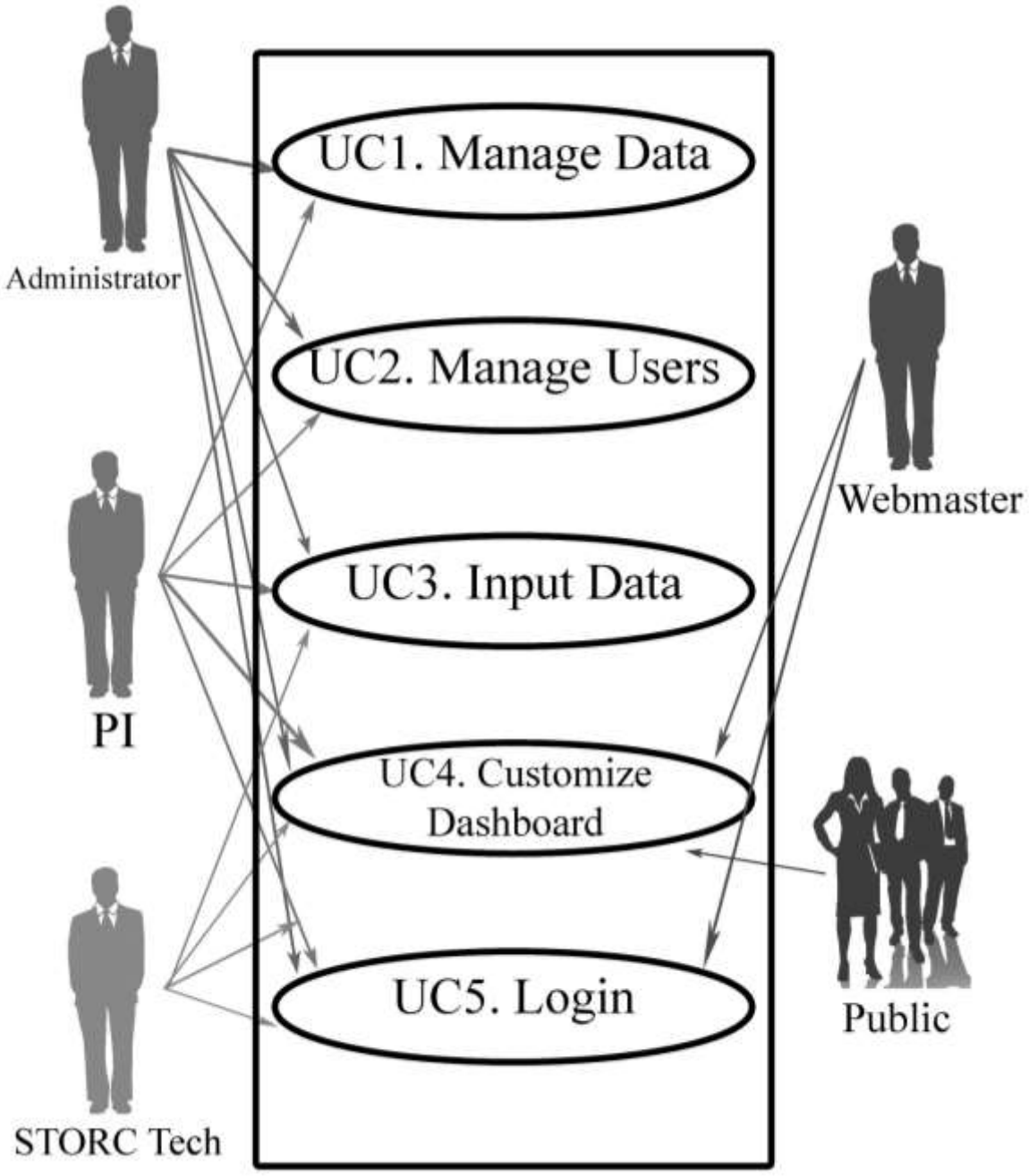

Figure 2: Use Cases

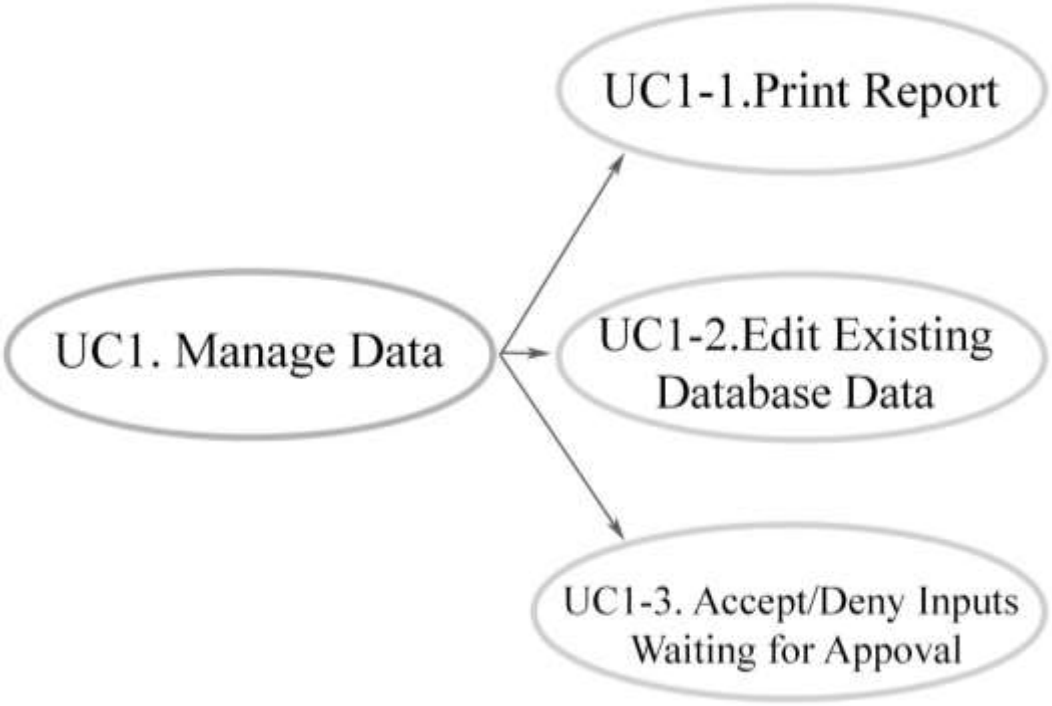

Figure 3: Manage Data

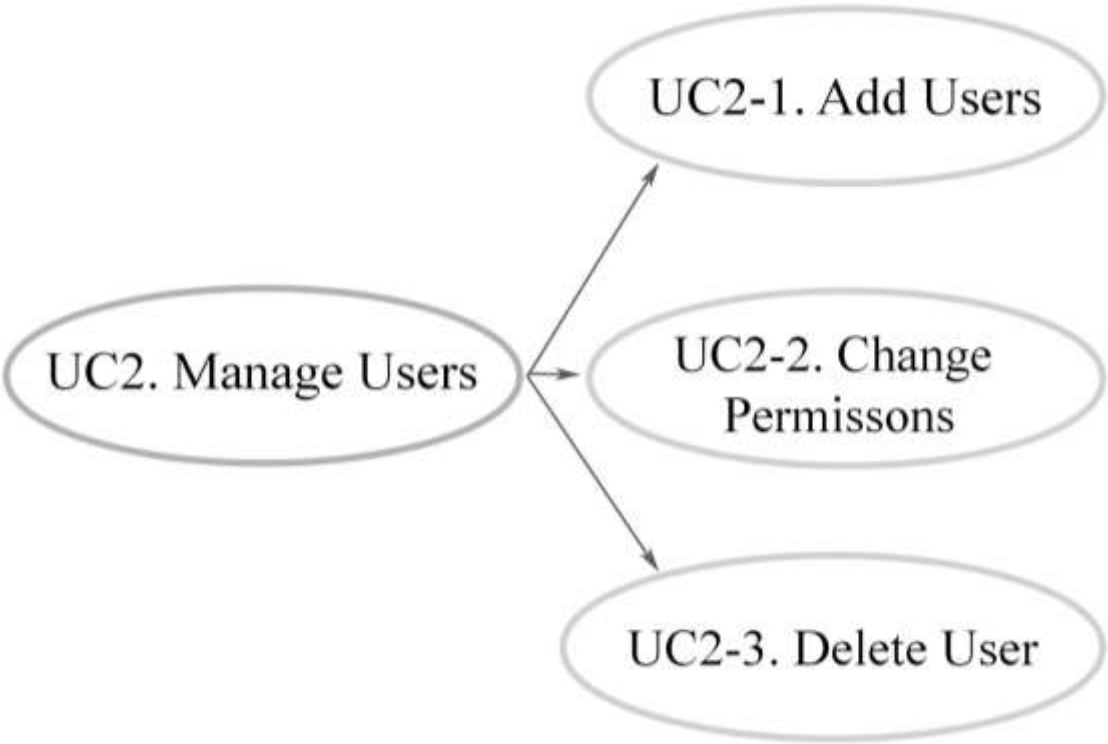

Figure 4: Manage Users

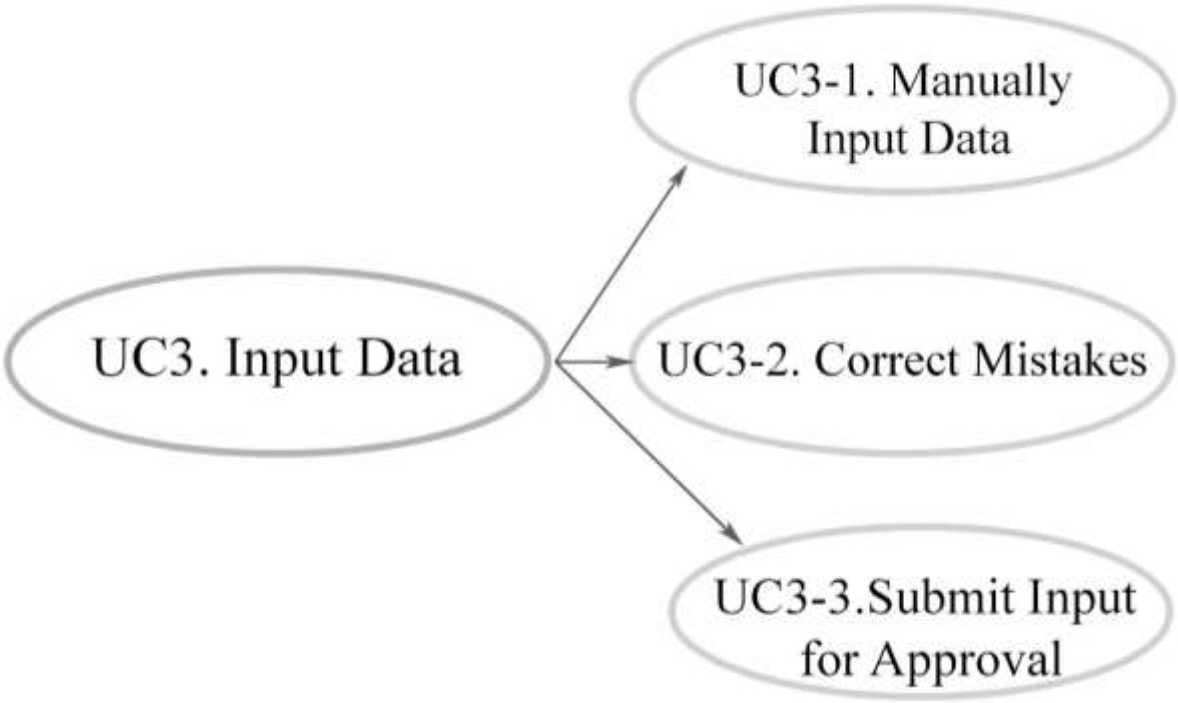

Figure 5: Input Data

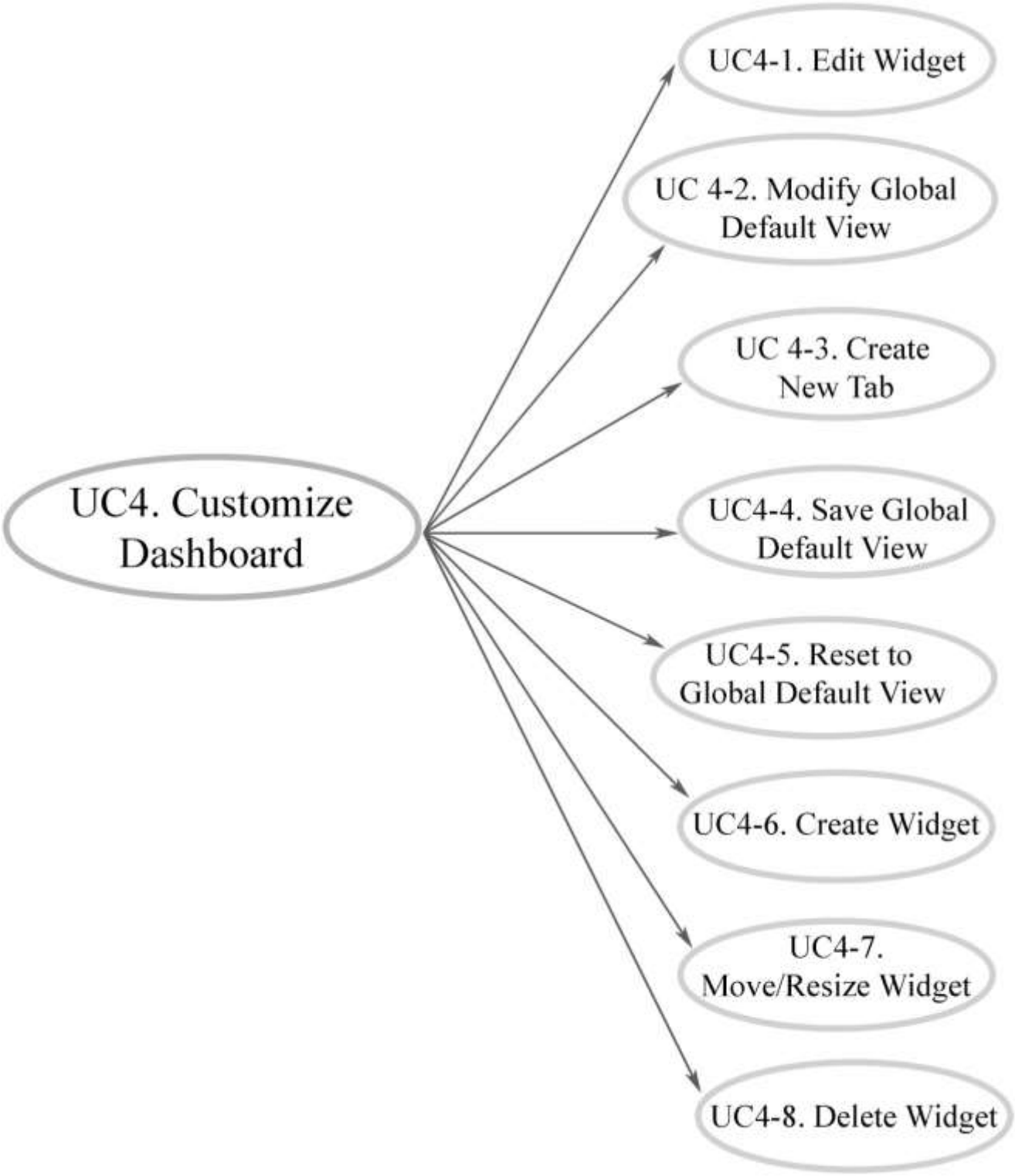

Figure 6: Customize Dashboard

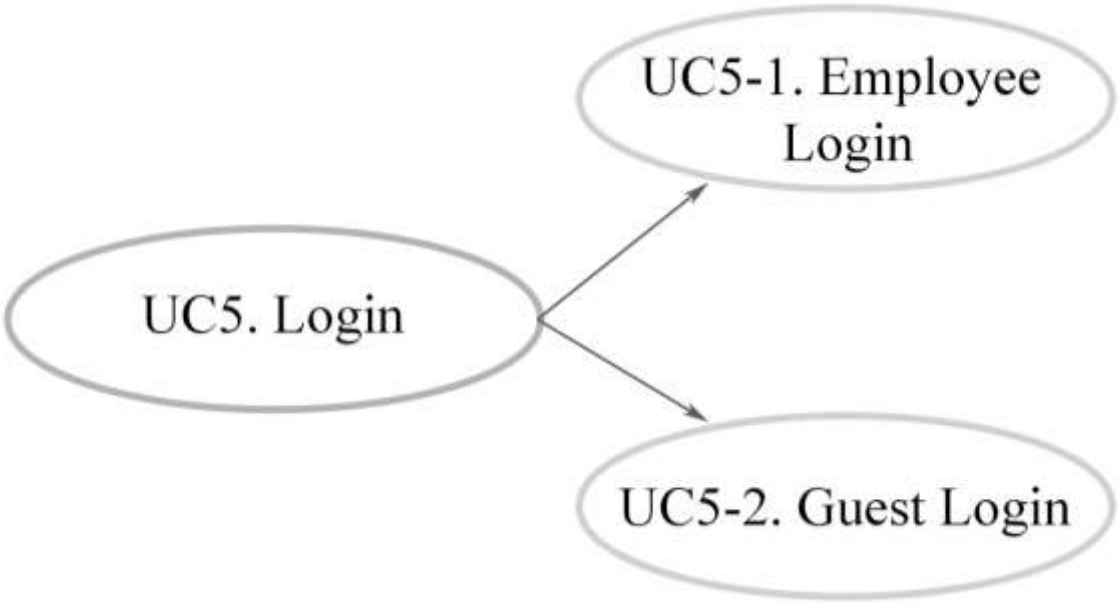

Figure 7: Login

2.3 Integration Design Specifications for Each Feature

2.3.1 UC-4 Customize Dashbaord

After logging in, the users of the STORC Dashboard will be presented with the dashboard view. This view will show them any saved dashboard tabs and their associated analytics-widgets. Widgets can be moved, resized, created, deleted, and modified. These changes can be saved, or conversely, the user's particular dashboard view can be reset to a default view. The following interaction design represents this UC4-"Customize Dashboard" Use Case in Figure 8. Red circled numbers represent potential supporting features of this use case, which are enumerated and explained

underneath each image.

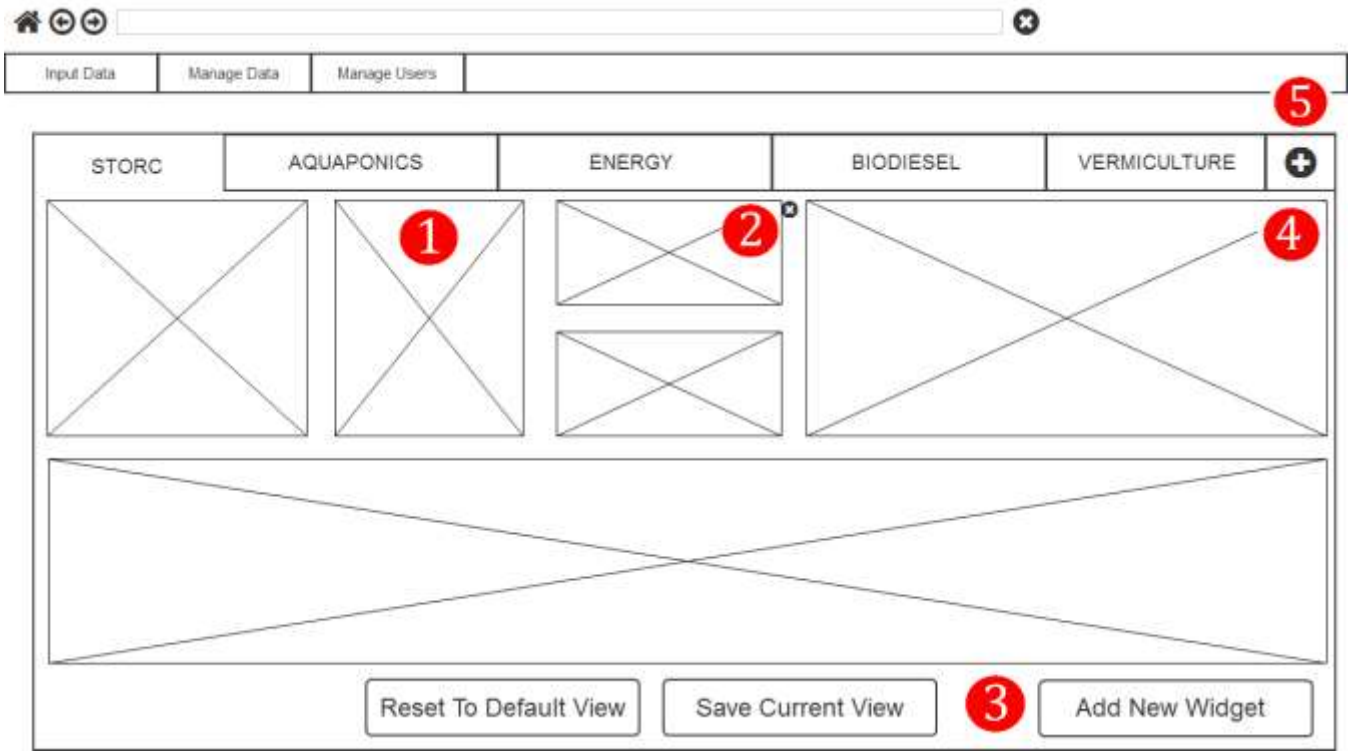

Figure 8: UC-4 Customize Dashboard

1. Customize Widget

   By right clicking on one of the widgets, the user will be presented with menus and dropdowns that can change the widget's data source(s), widget's chart type, color, and other relevant settings (Figure 8).

2. Delete Widget

   By clicking the X-icon in the top right corner of the widget, the widget can be deleted. There will most likely be a prompt to verify the user's decision before this widget deletion (Figure 8).

3. Add New Widget

   By clicking the Add New Widget button, the user will be prompted for widget data sources, chart type, color, and other relevant settings. After configuring the new widget's settings, a new widget will be added to the dashboard which the user can position and resize as they see fit (Figure 8).

4. Move/Resize Widget

   Moving and resizing a widget could be as simple as selecting the upper right corner of the widget and dragging and panning to resize and situate the widget on the dashboard. It is likely that automatic snap functionality will be included to make this supporting feature more user-friendly (Figure 8).

5. Create New Project Tab

   By clicking the plus-icon, a user could add a new renameable blank tab which could be populated with more widgets. This would give the user the ability to organize domains to study, or to keep specific projects separate and manageable (Figure 8).

2.3.2 UC-3 Input Data

If particular project stations require manual collection of data, STORC technicians, as well as admins and Principal Investigators, will be presented with a series of screens to help them quickly log and submit the data they have collected. This general use case must be supported by several supporting functionalities such as: filling out input forms, reviewing data, and submitting data for approval. Below are some potential interaction designs that could support this use case. Pertinent parts of each view are enumerated below in Figure 9, Figure 10, and Figure 11.

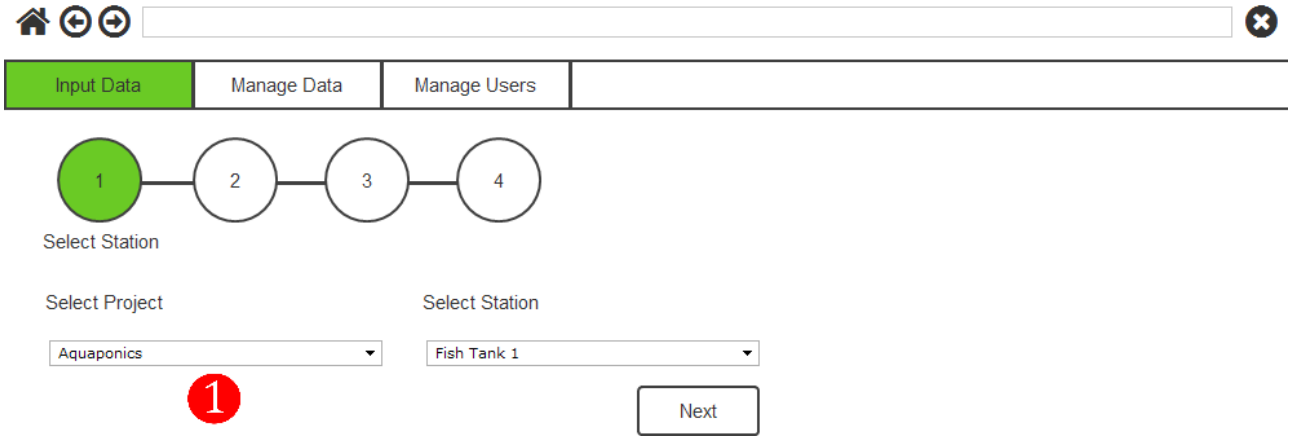

Figure 9: UC-3-1 Input Data

1. Select Project and Station

Users will select individual projects and stations that require manual input of data. Once selected they can proceed to the input form (Figure 9).

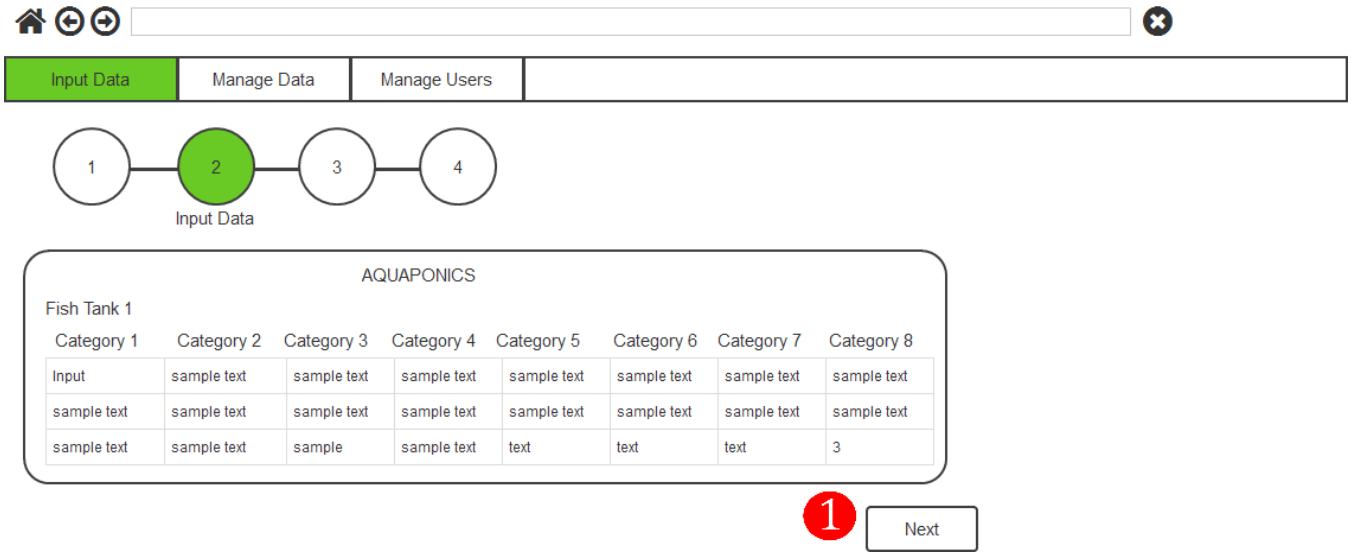

Figure 10: UC-3-2 Input Data

1. The user will be presented with a single row to fill out. This row will automatically show the column categories to make it easier to correlate a user's written data with the data to be entered. Once a row has been filled, a new row could automatically be generated to improve data entry flow (Figure 10).

Figure 11: UC-3-3 Input Data

1. Review and Submit Data for Approval

   Once the user has finished filling out the input form, they will be able to review all data they have inputted and then submit the data to the Principal Investigator for approval (Figure 11).

2.3.3 UC-2 Manage Users

Admins and Principal Investigators will be able to manage the users of the system. Principal Investigators will be supervised by Admins. STORC technicians will be supervised by PIs and Admins. Admins and PIs will be able to add, remove, and edit the permissions of those users over which they have supervisory control. In order to carry out this functionality, a section of the website should allow these users a simple way to do this. Below is a possible interaction framework for UC-2. Functionality will be enumerated below the in Figure 12.

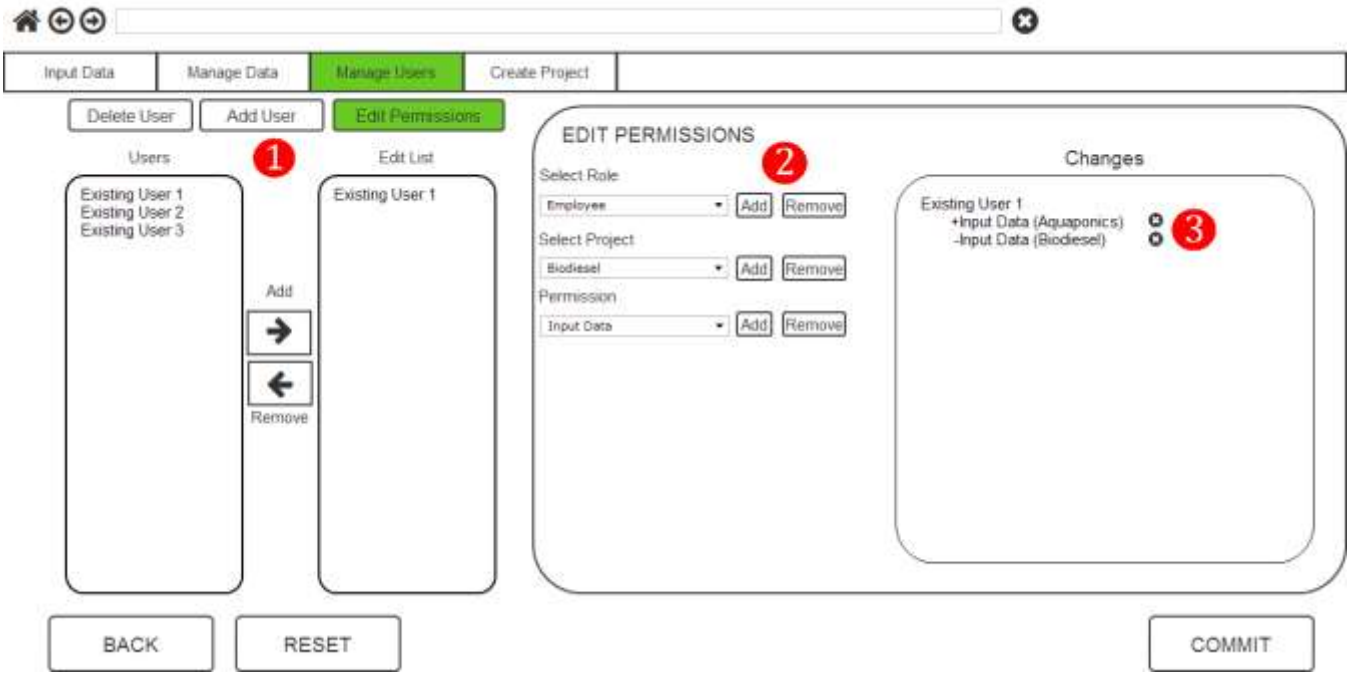

Figure 12: UC-2 Manage Users

1. Select between Add User, Delete User, Edit Permissions
   A list of all current users could be filtered and added to an edit list. All users on the edit list would then be affected by any changes the admin or PI selects (Figure 12).
2. Add or Remove Permissions or Access
   A series of dropdown boxes and buttons could add or remove access to each user on the edit list. These changes would be shown in the list on the right for clarity (Figure 12).
3. Undo Changes
   By clicking on the X icon, any erroneous changes could be quickly removed without having to start over from the beginning (Figure 12).

2.3.4 UC-3 Manage Data

Users (PIs and Admins) should be able to carry out the task of managing data in the system. This includes: approving data that STORC technicians have submitted (or rejecting the data), editing database data directly, or printing reports suitable for hardcopy. In Figure 13 and Figure 14 is an interaction design wireframe that demonstrates a possible way to approve data that has been submitted by STORC technicians.

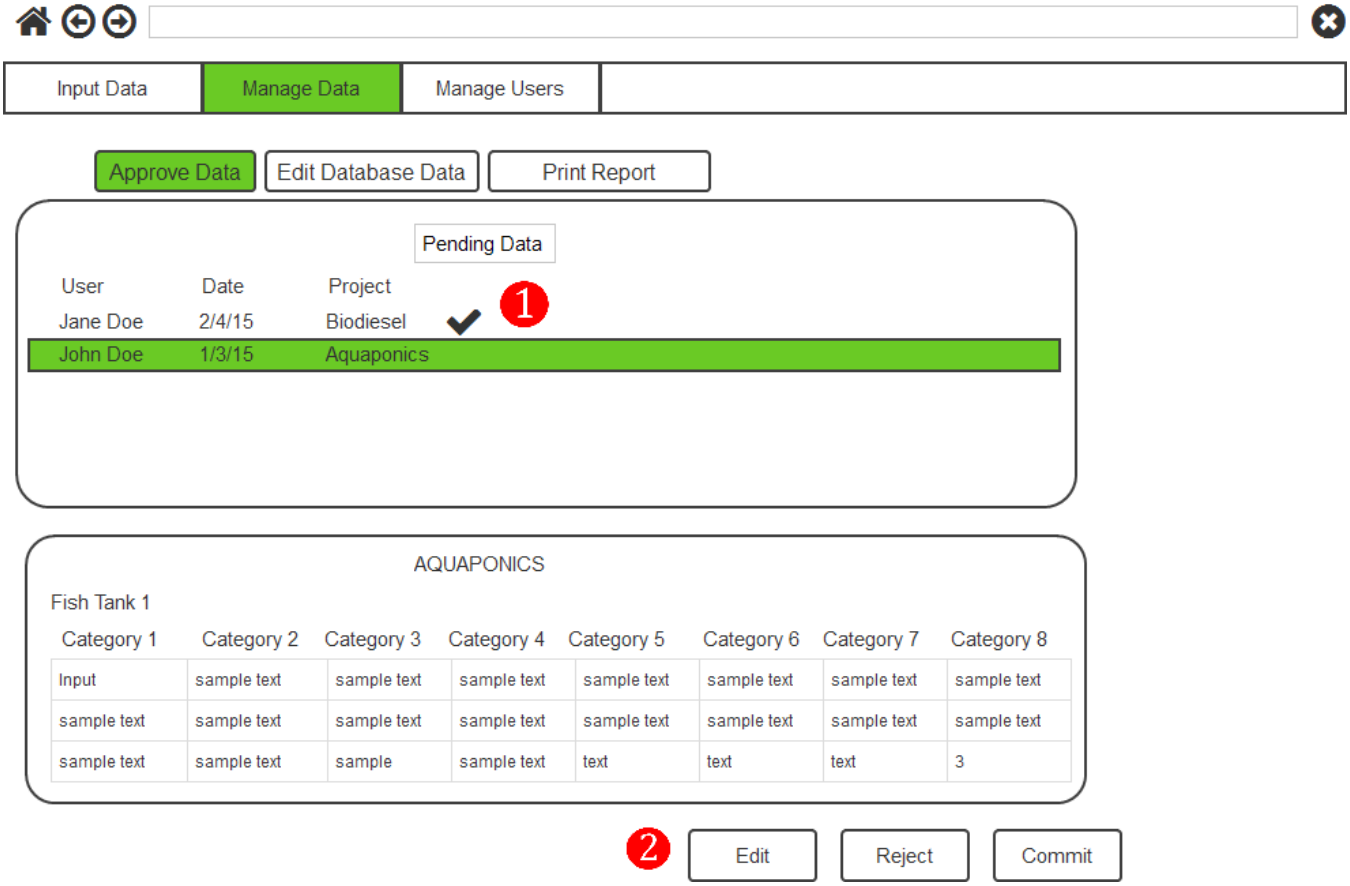

Figure 13: UC-3-1 Manage Data

1. View and Select Pending Data

   By clicking on a particular user submission, the data for that submission could be viewed beneath in a separate window. Once this data has been checked for errors and committed, a check mark could indicate that this particular technician's submission has been completed. The Admin or PI could then move on to the next item (Figure 13).

2. Edit, Reject, or Commit

   The Admin or PI could choose to edit the submission directly if the error could be corrected without having to recollect the data. The Admin of PI could also simply choose to reject the submission, which would send a notification to the submitting user to redo the input, or recollect the data. Committing would enter the information into the relevant database table(s) (Figure 13).

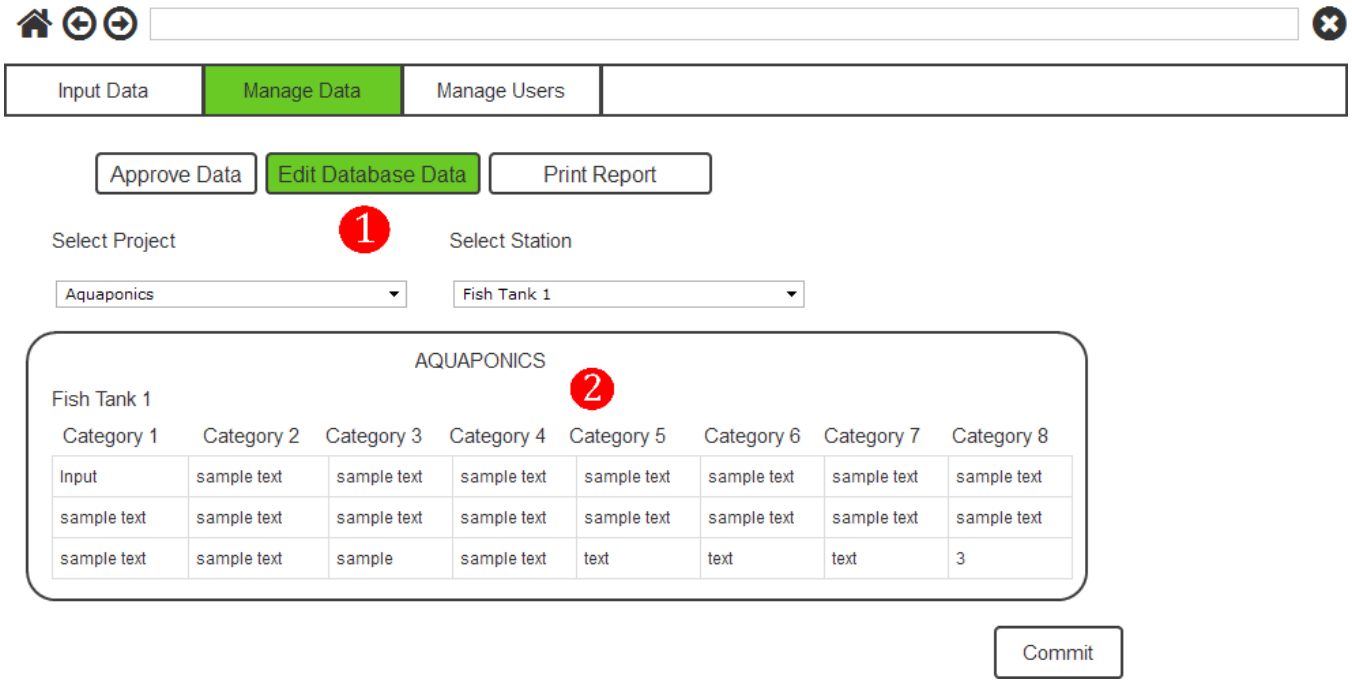

Figure 14: UC-3-2 Manage Data

1. Select Project and Station to Edit

   An Admin or PI could directly correct erroneous data in the database by selecting a particular data set from a project and station. This would populate the data below in a simple to read table (Figure 14).

2. Edit Data

   Admins or PIs could edit any field by using a simple click and edit interface, much like Excel. Once the data is correct, the Admin or PI could commit this data back into the database (Figure 14).

2.4 User Characteristics

The STORC Dashboard Project will allow users to monitor, analyze, and input data, both real-time and historical. Users of the system will be: Principal Investigators, other Administrators, STORC Employees, and the public.

The Sponsor, Michael Christensen, as well as other administrators will be able to manage data, input data, monitor all existing projects, and customize the view of the STORC Dashboard Project.

Principal Investigators will be able to create and accept new projects, input and view data, and customize the view of the STORC Dashboard Project.

STORC Technicians will be able to view data, input data, and customize their STORC Dashboard Project.

The Webmaster will be able to customize the public view of the STORC Dashboard Project.

The public will have access to a webpage that show stats and other current news pertaining to STORC along with an overall summary of each STORC project. They will also be able to customize their dashboard view, although this information will not be saved as it is with admins, PIs, and technicians.

The Administrator, PIs, STORC Employees, and the Webmaster will receive status alerts for projects they are currently working on.

2.5 General Constraints

There are several constraints related to the STORC Dashboard Project. The first constraint concerns network reliability. If the wireless network at CSUS is temporarily lost or the network is experiencing lag due to a high number users on the network, the data sent to that database will be sent at a later time when each Raspberry Pi regains network connectivity. Another constraint involves security. This can be split into two categories: physical and informational security. Physical security pertains to the security of the Raspberry Pis and the sensors. Since STORC is often open to the public, station sensors and Raspberry Pis may be damaged. The STORC Dashboard Project must be able to deal with this by allowing data that is normally sent automatically to the database to be entered manually. Informational security is also another constraint for this project. STORC technicians could share their usernames allowing for security gaps between projects.

2.6 Assumptions and Dependencies

Both CD Jam and the Sponsor are working under several shared assumptions. It is assumed that the completed project will be computer code written in a standard language that can be read and understood by a third party familiar with that language. e.g. HTML, Javascript, MySQL, etc. CD Jam will not be writing or developing code in a completely new language. This will allow for maintenance and portability by a third party after CD Jam has delivered the product.

It is assumed by both CD Jam and Sponsor that the product's computer code will be written in such a way that it can be understood and maintained by a third party after delivery of the product. It is also assumed that the final product will not require detailed technical knowledge or expertise on the part of the user. Since the final product will take the form of a web interface, it should be simple and easy to use for STORC employees.

Some project constraints pertain to the setup and project scope. Since the project requires data-gathering and processing from sensors that will be monitoring the various projects that STORC is researching, this infrastructure must be complete before work begins on the design stage. If the sensors and other control equipment have not been set up, a system designed to gather, process, and display information in an accessible and user-friendly way cannot be implemented. Both CD Jam and Sponsor agree that the scope will be limited to a system designed to collect, view, store, and manage data from various sources related to the current projects at STORC.

3. SPECIFIC REQUIREMENTS

3.1 Use Case Specifications

3.1.1 Information Model

STORC's future physical layout will be an economically and environmentally sustainable closed loop system, with specific projects belonging to higher level project domains. These projects fulfill a variety of purposes that serve the overall goal of sustainability. These include a wide range of tasks such as composting, aquaponics farming, or energy production. Individual stations like fish tanks, compost bins, worm bins, grow beds, etc, belong to each of these projects and are the ultimate physical link to the data analysis that STORC Dashboard will allow the investigators, volunteers, and administrators to do. Current STORC projects include biodiesel production, vermicomposting, hot composting, aquaponics farming, solar thermal collection, and water treatment.

Because the data collected from these individual elements is varied and non-homogenous, the information model for the STORC Dashboard project is unusual in that it is represented in a flatter configuration. To demonstrate this it is useful to use one of the current STORC projects as an example.
Aquaponics is one of the major projects at STORC, it consists of growing plants and raising fish together by utilizing fish waste in a closed system to feed plants. The data collected from one of seven of the fish tanks associated with the aquaponics project could consist of the following elements: tank temperature, tank O2 concentration, tank ammonia concentration, number of fish, and water pH. However, the grow-beds associated with the aquaponics project may capture data such as: greenhouse humidity, greenhouse temperature, ambient temperature, and plant production numbers.

There would be some minor attribute commonalities between these stations such as an ID, a name, and location, but other attributes may have no common factors between stations; a compost bin has little in common with a fish tank, apart from an ID and a name. This makes it impossible to create an abstract entity of a station or a data point. Due to this, no abstract data-capture table would be able to cover all the different configurations of captured data. Though still implementable, this results in the ERD (Figure 15, Figure 16, and Figure 17) and information model (Figure 18) below. Below are the ERDs to support a database that will support the STORC Dashboard.

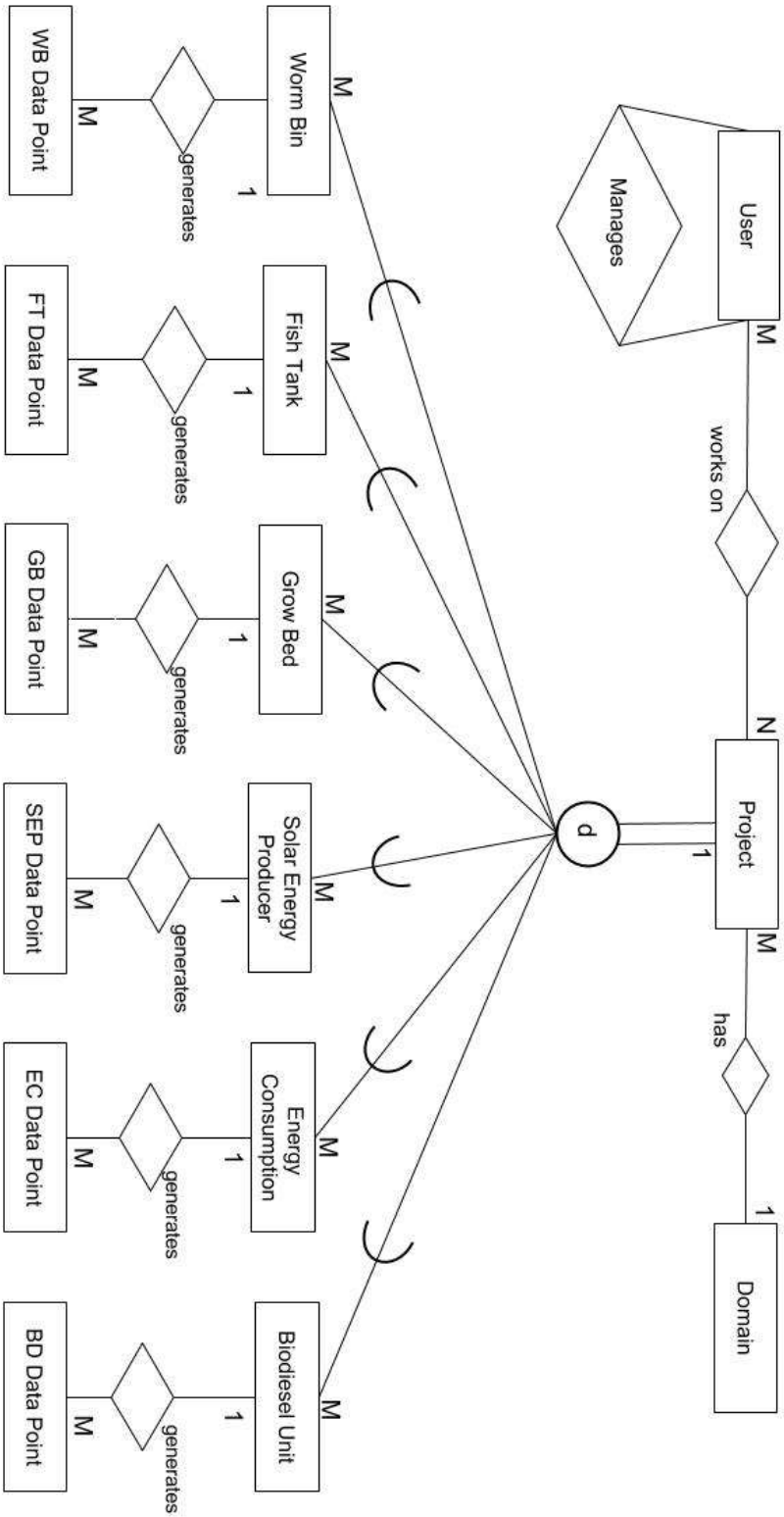

Figure 15: ERD General Overview

Due to the complexity of the ERD the attributes for every entity cannot be shown in Figure 15. To further clarify the ERD the fish tank subsection of the previous ERD is shown in Figure 16, with attributes:

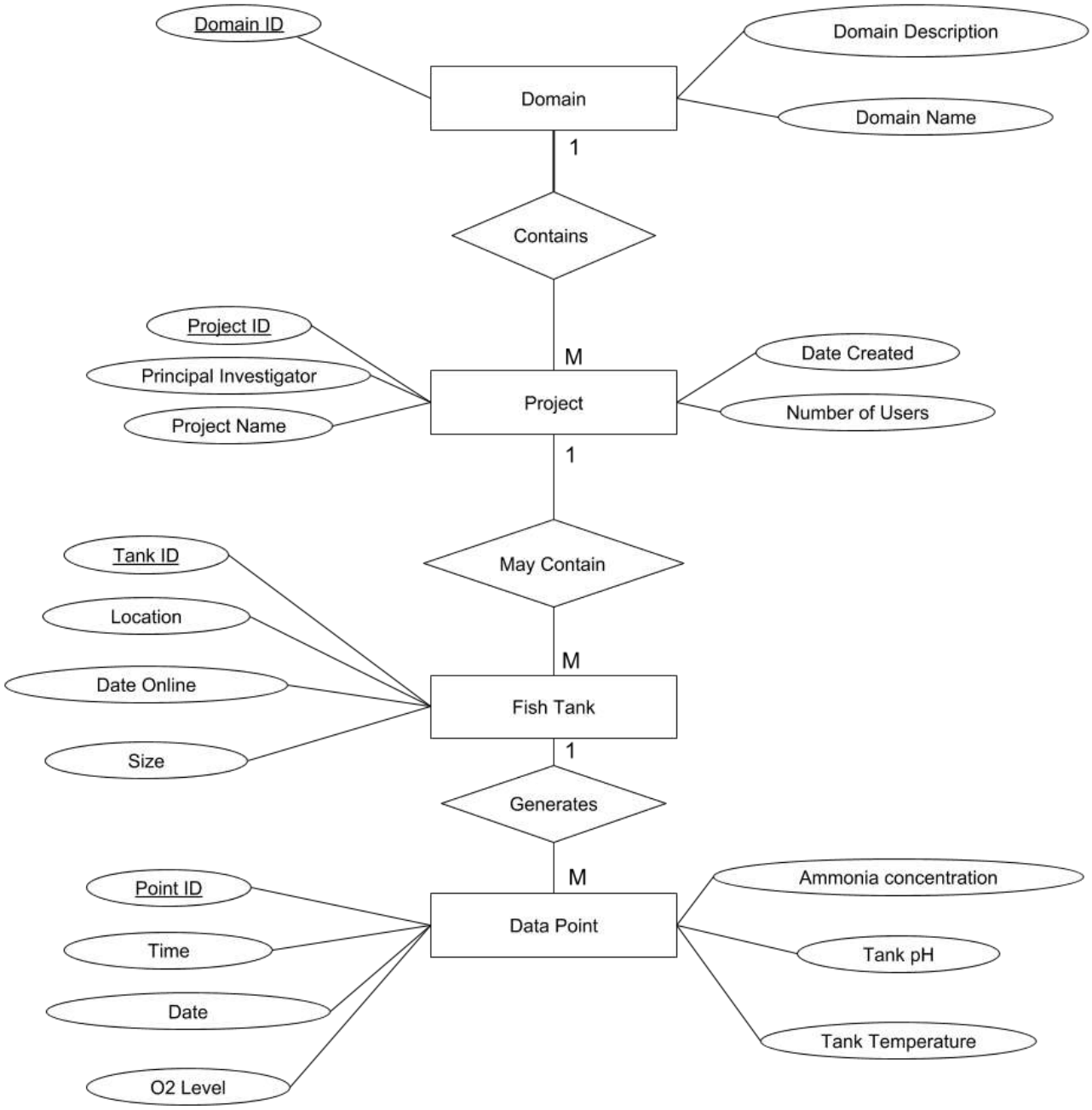

Figure 16: ERD Detail - Domain - Project - Fish Tank - Data Point

Figure 17 is a detailed ERD subsection showing the relationship and attributes between a system user and a project:

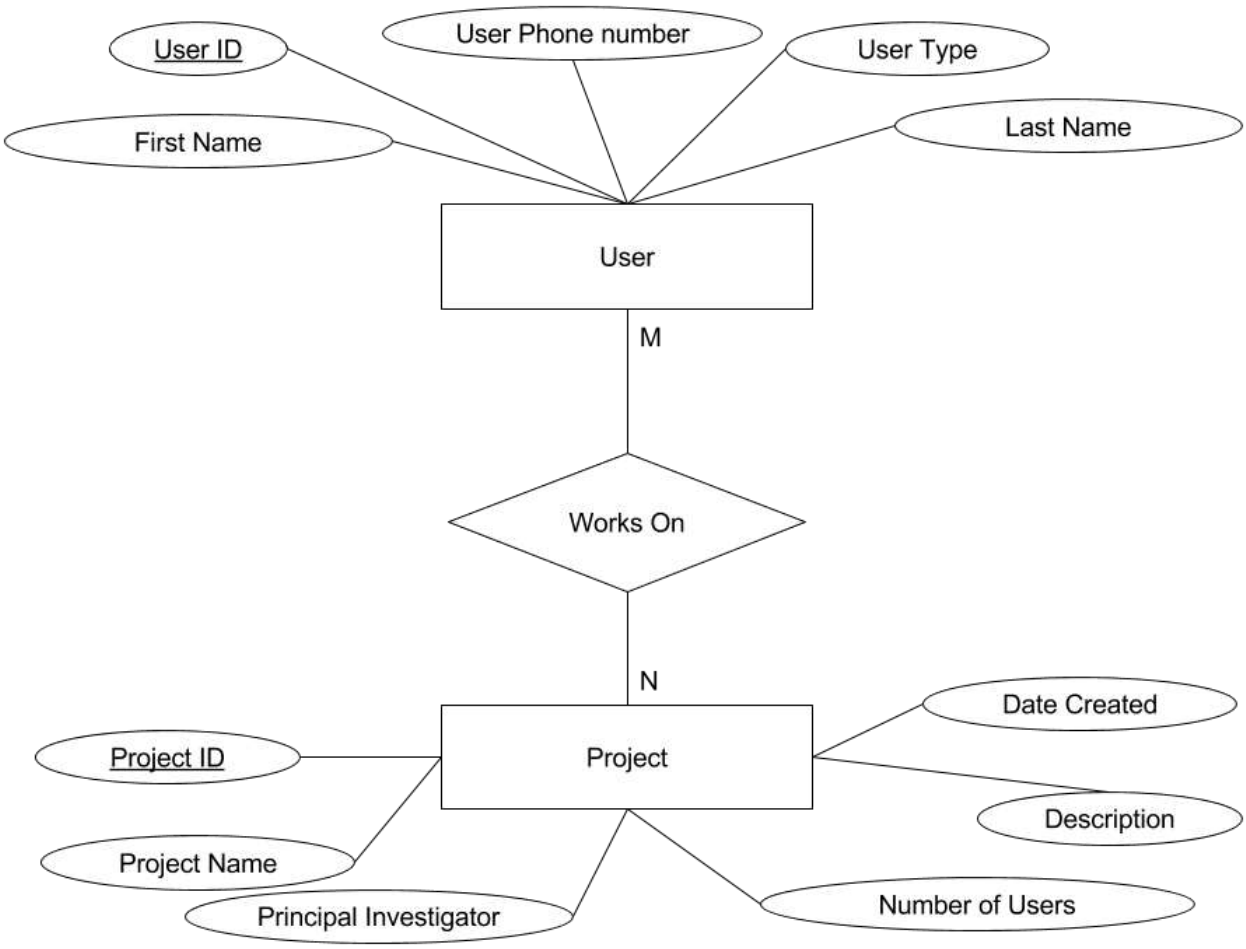

Figure 17: ERD Detail - User - Project

The many-to-many relationship between various STORC projects and the users of the system will require an associative entity type to clarify the relationship between these two entities. This table can be seen more clearly in the Information Model in Figure 18:

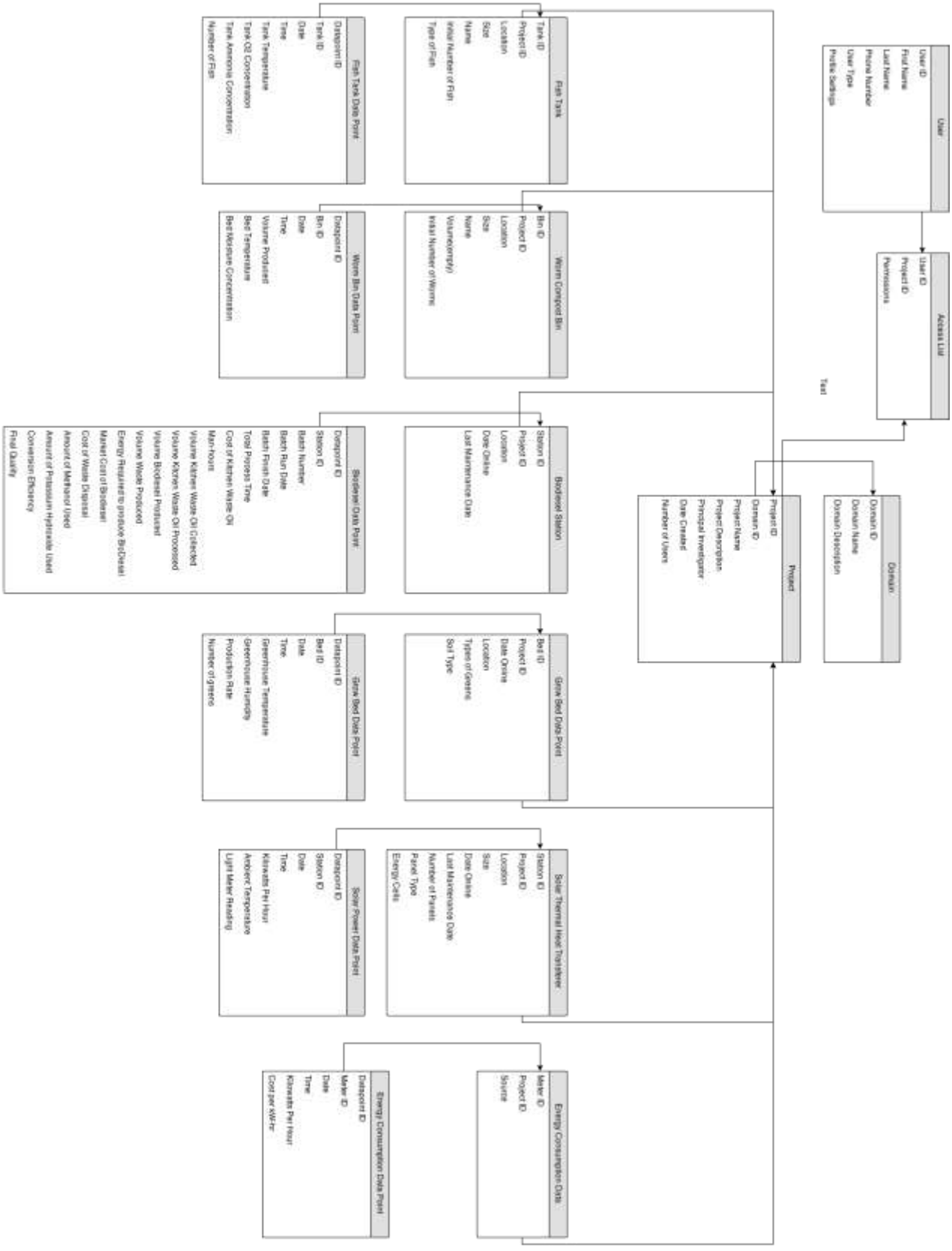

Figure 18: Information Model

Figure 18 only represents the current projects and data capture stations at STORC. Any additional station types would be added as one-to-many relationships underneath the project table, similar to how the currently model integrates fish tanks, grow bins, etc. New projects will be coming online during the Summer and Fall semesters and the database implementation may change based on this dynamic environment.

3.2 Performance Requirements

The STORC Dashboard's performance will be limited by IRT's network capability and load. However, the STORC Dashboard should be able to handle many simultaneous users submitting and viewing data. No workstations will be required for STORC Dashboard since it is a web application. Only one server will be needed for the application to run which will be handled by IRT. The size of the database will be grow over time since the STORC Dashboard will be collecting data on a daily or weekly basis.

3.3 Design Constraints

The software constraints for the STORC Dashboard deal with the fact that different users will be viewing the application with different web browsers or different versions of the same web browser. It is possible that not all web browsers will be compatible with the STORC Dashboard. Older versions of a web browser may make it incompatible with some of the features in the STORC Dashboard. Hardware compatibility issues in the STORC Dashboard may require switching to different sensors or other measuring devices on certain projects. It will not be guaranteed that future measuring devices will work with the STORC Dashboard as they may read data differently than the current sensors at STORC.

3.4 Quality Attributes

3.4.1 Reliability

The STORC Dashboard Project must be as reliable as possible. Problems such as: sensor failure, database errors, server malfunctions, incorrect data entry, loss of internet connectivity, or power outages may negatively impact the functionality of the STORC Dashboard Project. Sensor failure must be taken into consideration as it may store erroneous or no data in the database. The database could also fail, resulting in loss of data. During these events incoming data may not be captured causing the STORC Dashboard Project to become out of sync with event. Server interruptions may cause problems with employees accessing the STORC Dashboard Project. An active internet connection is required in order to provide real-time updates and to allow users to submit new data to the database. Power outages may cause the server and some sensors to shut down, resulting in loss of real time data.

3.4.2 Maintainability

STORC will receive a copy of the STORC Dashboard Project source code and internal documentation to allow for ongoing and future maintenance.
The STORC Dashboard Project will be sufficiently documented to allow developers unassociated with the initial development effort to understand the system and functional relationships. The source code will be documented using a consistent style established by

the team. The STORC Dashboard Project will be flexible in its design, to enable functional enhancements to the software when necessary.

3.4.3 Program Quality Attributes

3.4.3.1 Readability, Understandability, and Comprehensibility

The STORC Dashboard Project must be designed in a way that all STORC employees can easily navigate each web page. CD Jam has worked with the Project Sponsor to solidify a design that would work for STORC as a whole. Each web page needs to be visually appealing and contain all of the pertinent information about each STORC project in a precise manner.

3.4.3.2 Robustness

The STORC Dashboard will warn the user of invalid input before submission to the database. Furthermore, in order to submit data to the database the PI of the project must authorize the data entered is correct. Any valid but incorrect entries will therefore have two sets of validation. The PI should be able to catch any syntactically correct, but logically incorrect data input requests. The PI may either accept or reject requests and make the students redo their work. This should provide for a robust error checking system.

The STORC Dashboard Project should also be able to correct for automatic sensor errors. If the data the sensor is reading and putting into the database is not within the sensor threshold range it shall automatically alert the pertinent users. If a faulty sensor is discovered a PI will have the ability to delete the data produced by the sensor.

3.4.3.3 Speed of Execution

Since the STORC Dashboard Project will monitor real-time data, minimal amounts of discrepancy between newly collected data and the data shown on the STORC Dashboard Project should be experienced. Other functions of the STORC Dashboard Project such as data input, user management, and dashboard customization should have little to no UI latency. However, these attributes are reliant upon the constraints detailed in section 2.5. The system will not be designed to take into account network outages, hardware failure, and other events that are out of the scope of the design specifications.

3.4.4 Security

To protect STORC's information the STORC Dashboard Project will have different user abilities depending on what access rights each user is given by the administrator. In order to login to the system the user will use their Sac State ID. Not all individuals with a Sac State account will be able to log into the STORC Dashboard, only those that administrators and PIs have given access to. If a user gives their credential information to another person it may compromise the security of the application. To mitigate this, technicians and PIs will only have access to certain projects within STORC. This limits users to only the projects they are associated with. Furthermore, STORC technicians are only allowed to submit data for input. They will not be allowed to delete or commit data to the database. The PI's and Administrator are the only ones who can delete or commit technician data to the database. The public will not be able to login to this system and

will only be able to view the dashboard. The public is only able to view certain data thus keeping STORC's information secure. Database backups will be handled by IRT.

3.4.5 Transferability / Conversion

The STORC Dashboard Project will not have any specific operating system dependencies since it is a web app with a server-side database. The STORC Dashboard Project will be accessed through a web browser. Any of the major web browsers that support HTML5 will work (Internet Explorer, Firefox, Chrome, Safari). This will allow full functionality of the STORC Dashboard Project on a variety of computer and mobile devices.

3.4.6 Operational Quality Attributes

In order for the STORC Dashboard Project to be used by the PIs and students running STORC layout is key. An inviting and easy to navigate GUI that is fully customizable will be created. Users will have the ability to pick and choose the data from certain projects and be able to move graphs and charts around on their page. All vernacular related to STORC will be used to make the STORC Dashboard Project easy to navigate for new users that are not familiar with the software. Help guides will be distributed throughout each section of the STORC Dashboard Project in order to guide users through the setup of their view and help them understand how to use the application.

3.4.7 Operations

The STORC Dashboard Project has a series of normal operations. All users will be able to login, either with a guest or CSUS id and customize their dashboard. Administrators will have the ability to add users, remove users, view data, edit data, and add data. PIs will be able to add users, remove users, view data, edit data, and add data. Students can submit data, but this data must be approved before being stored in the database. Webmasters can add projects by the request of an administrator or a PI. The public may only see and temporarily customize the dashboard. Sensors will send data to the database every second. This data will be collected and then stored in the database. To reduce the size of the database time driven events will take a minute worth of data and average out the results. This averaging will also be done every hour and every day as to minimize the overall size of the databases needed, while containing all of the relevant information for grants and research projects. All backups for the database will be performed by IRT, and the STORC server will be backed up by a STORC student employee. If a user leaves STORC Dashboard Project unattended for five minutes a timeout will occur and the user will be logged out of the dashboard.

3.4.8 Site Adaptions

Currently STORC does not have an existing system for STORC Dashboard Project thus no unique modifications will be required. The only modification that would need to be made is if the Sponsor would like to put a link on the current STORC website which redirects the users to the STORC Dashboard Project. The STORC Dashboard Project will be written in HTML5 which can be accessed from a web browser of the user's choosing.

4. APPROVALS

By signing you agree that all conditions and commitments to the project are accurate to the best of your knowledge. I certify that the information in this Software Requirements Specification is correct and the senior project group *CD Jam* can continue on with the design of the project. I also certify that this is a living document and any updates that need to be made after signing the document will need to go through the change control process. Any approved changes may require the renegotiation of the scope of the work that can be done within CD Jam's senior project.

CD Jam Team members:

X _____
Cole Culler

X _____
David Grapentine

X _____
Ashley Gregory
Project Lead

X _____
John Jones

X _____
Michael Smith

Faculty Advisor:

X _____
Ying Jin
Faculty Advisor

STORC Dashboard Sponsor:

X _____
Michael Christensen
Sponsor

APPENDIX A – Data Dictionary

Data Elements

Access List

Element	Description	How it is Set	How it is Use	Value Type	List of Discrete Values	Range
Permissions	Limits access of users	User input	Limits the access of the certain aspects of the database from other users	Integer	Must be 9 digits long	0-9
Project ID	A projects unique identification	Create by database on creation	Used to identify specific projects	Integer	Must be 9 digits long	0-9
User ID	A users unique identification	Acquired from CSUS ID	Used to identify specific users	Integer	Must be 9 digits long	0-9

Biodiesel Station

Element	Description	How it is Set	How it is Use	Value Type	List of Discrete Values	Range
Date Online	Date of online date	Manually entered by database manager	Stores the start date of the project, used in project description	Date	N/A	N/A
Last Maintenance Date	The last data the station was maintained	Manually entered by the user	To keep track of the last date the biodiesel is maintained	Date	N/A	N/A
Location	Location of the Biodiesel Station	Manually entered by database manager	It stored the location of the project	varchar(30)	N/A	A-Z, a-z
Project ID	A projects unique identification	Create by database on creation	Used to identify specific projects	Integer	N/A	N/A
Station ID	A station unique identification	Create by database on creation	Used to identify specific projects	Integer	N/A	N/A

Biodiesel Data Point

Element	Description	How it is Set	How it is Use	Value Type	List of Discrete Values	Range
Amount of Methanol Used	Contains the amount of methanol used	Entered in by a user manually	Used as a factor to determine the sustainability of a project	Float	N/A	N/A
Amount of Potassium Hydroxide Used	Contains the amount of Potassium Hydroxide used	Entered in by a user manually	Used as a factor to determine the sustainability of a project	Float	N/A	N/A
Batch Finish Date	Lists the date when a batch of biodiesel finished production	Entered in by a user manually	Used to show all date biodiesel batch finished productions	Date	N/A	N/A
Batch Number	Used to identify the batch number of biodiesel produced	Entered in by a user manually	Used keep track of the biodiesel produced by the biodiesel station	Integer	N/A	N/A
Batch Run	Used to identify the batch run of biodiesel produced	Entered in by a user manually	Used keep track of the biodiesel produced by the biodiesel station	Integer	N/A	N/A
Conversion Efficiency	Shows the energy used to produced the biodiesel per gallon of fuel	Entered in by a user manually	Data measured that show how efficient it is to make biodiesel	Integer	Must be a single digit	1-10
Cost of Kitchen Waste Oil	Cost to purchase kitchen waste oil	Entered in by a user manually	The price per gallon of kitchen waste oil purchased	Float	N/A	N/A
Cost of Waste Disposal	Cost to dispose of all toxic waste produced in the biodiesel making process	Entered in by a user manually	The cost of properly disposing the waste left from the production	Float	N/A	N/A
Datapoint ID	ID of the data point	Create by database on creation	Used to identify specific projects	Integer	N/A	N/A
Energy Required to produce Biodiesel	The overall amount of energy needed to produce biodiesel	Entered in by a user manually	Used to measure the sustainability of the biodiesel overtime	Float	N/A	N/A
Final Quality	Grade of the quality of diesel produced	Entered in by a user manually	A range of values the represents the quality of biodiesel	Integer	Must be a single digit	1-10
Man-hours	Man hours spent on a project	Entered in by a user manually	The numbers of hours spent on producing a batch of biodiesel	Integer	N/A	N/A

Market Cost of Biodiesel	The market cost per gallon of biodiesel	Entered in by a user manually	Lists the current market cost of biodiesel	Float	N/A	N/A
Station ID	A station unique identification	Create by database on creation	Used to identify specific projects	Integer	N/A	N/A
Total Processed Time	Total time needed to produced a batch of biodiesel	Entered in by a user manually	Total amount of time spend producing a batch of biodiesel	Time	N/A	N/A
Volume Biodiesel Produced	The amount of biodiesel produced, measured in gallons	Entered in by a user manually	The measurement in gallons of the amount of biodiesel produced	Float	N/A	N/A
Volume Kitchen Waste Oil Collected	The amount of kitchen oil waste used in production of biodiesel	Entered in by a user manually	The measurement in gallons of the amount of kitchen oil used in the production batch of biodiesel	Float	N/A	N/A
Volume Kitchen Waste Oil Produced	The waste of the kitchen oil left after the production of biodiesel	Entered in by a user manually	The measurement in gallons of the amount of kitchen oil waste produced in the production batch of biodiesel	Float	N/A	N/A
Volume Waste Produced	The total amount of waste produced in the biodiesel making process	Entered in by a user manually	The amount of waste produced in the overall production of a batch of biodiesel	Float	N/A	N/A

Domain Table

Element	Description	How it is Set	How it is Used	Value Type	List of Discrete Values	Range
Domain Description	A domain is a group of projects.	PI would specify what the domain is for each project.	This is used to identify where each project belongs.	String	N/A	N/A.
Domain ID	This will be a specific identification number assigned to each domain of projects.	The system will automatically create an ID number for the domain.	The ID will be unique to each domain. It is used to identify the domain.	Int	N/A	N/A

Domain Name	This will be the actual name for each domain.	The PI will manually enter the name of each domain created.	This will be used to identify each domain.	Varchar	N/A	N/A

Energy Consumption Data

Element	Description	How it is Set	Value Type	List of Discrete Values	Range
Meter ID	Number that identifies the meter	Database default	Int	N/A	N/A
Project ID	Number that identifies the project	Database default	Int	N/A	N/A
Source	Where the energy is coming from	User Input	Varchar	N/A	N/A

Energy Consumption Data Point

Element	Description	How is it set	How is it used	Value Type	Discrete values	Range
Cost per KW-hr	The cost of STORC energy consumption	user input	Used to track STORC sustainability. Contrasted against cost of energy production	Float	N/A	N/A
Datapoint ID	Number to distinguish data entries	automatically	Used to distinguish multiple data entries	Int	N/A	N/A
Date	Date that the data point is recorded	automatically	used to specify date range for analytics	Date	N/A	1000-01-01 to 999-12-31
Kilowatts Per Hour	Amount of energy consumed by STORC	user input	Used to track STORC sustainability. Contrasted against STORC energy produced	Float	N/A	N/A
Meter ID	Number to distinguish different meters	automatically	Used to distinguish multiple meters	Int	N/A	N/A
Time	Time data point is recorded	automatically	Used to specify time energy consumption data point is recorded	Time	N/A	-838:59:59 To 838:59:59

Fish Tank

Element	Description	How it is Set	Value Type	List of Discrete Values	Range
Initial Number of Fish	Number of fish that is in the tank when project is set up	User Input	Int	N/A	N/A
Location	The location of the tank within the STORC site	User Input	Varchar	N/A	N/A
Name	Name of the tank	User Input	Varchar	N/A	N/A
Project ID	Number that identifies the project	Database default	int	N/A	N/A
Size	The size of the tank in gallons	User input	Float	N/A	N/A
Tank ID	Number that identifies the tank	Database default	int	N/A	N/A
Type of Fish	The types of fish that are located	User Input	Varchar	N/A	N/A

Fish Tank Data Point

Element	Description	How it is Set	Value Type	List of Discrete Values	Range
Datapoint ID	Number that identifies the data point	Database default	Int	N/A	N/A
Date	The date the data point was captured.	User Input	Date	N/A	1000-01-01 to 9999-12-31
Number of Fish	The number of fish currently in the tank	User Input	Int	N/A	N/A
Tank Ammonia Concentration	Amount of concentration for ammonia that is in the tank	Sensor Input	Float	N/A	N/A
Tank ID	Number that identifies the tank ID	Database Default	Int	N/A	N/A
Tank O_2 Concentration	Amount of O_2 concentration that is in the tank	Sensor Input	Float	N/A	N/A
Tank Temperature	The tank temperature	Sensor Input	Float	N/A	N/A
Time	The time the data point was captured.	User Input	Time	N/A	-838:59:59 – 838:59:59

Grow Bed

Element	Description	How is it set	How is it used	Value Type	Discrete Values	Range
Bed ID	Number to	user input	Used to	int	N/A	N/A

	distinguish grow beds		distinguish multiple grow beds			
Date Online	Date when grow bed project begins	user input	Used to specify range for analytics	Date	N/A	1000-01-01 to 999-12-31
Location	The STORC location of grow bed project	user input	Used in grow bed calculations	Varchar	N/A	N/A
Project ID	Number to distinguish projects	automatically	Used to distinguish between multiple projects	Int	N/A	N/A
Soil Type	The type of soil used in grow bed	user input	Used in grow bed calculations	Varchar	N/A	N/A
Types of Greens	Type of greens produced in grow bed	user input	Used in grow bed calculations	Varchar	N/A	N/A

Grow Bed Data Point

Element	Description	How is it set	How is it used	Value Type	Discrete values	Range
Bed ID	Number to distinguish grow beds	user input	Used to distinguish multiple grow beds	Int	N/A	N/A
Datapoint ID	Number to distinguish data entries	automatically	Used to distinguish multiple data entries	Int	N/A	N/A
Date	Date that the data point is recorded	automatically	used to specify date range for analytics	Date	N/A	1000-01-01 to 999-12-31
Greenhouse Humidity	Measurement of Humidity at grow bed location	user input	Used for a factor in growth rate calculations	Float	N/A	N/A
Greenhouse	Measurement	user input	Used for a factor in	Float	N/A	N/A

Temperature	of Temperature at grow bed location		growth rate calculations			
Number of Greens	Number of greens units produced	user input	Used for a factor in growth rate calculations	Int	N/A	N/A
Production Rate	The rate at which greens are produced	user input	referenced for grow bed analytics	Int	N/A	N/A
Time	Time data point is recorded	automatically	Used to specify time grow bed data point is recorded	Time	N/A	-838:59:59 To 838:59:59

Project Table

Element	Description	How it is Set	How it is Used	Value Type	List of Discrete Values	Range
Project ID	This is a unique ID number associated with each project.	This is created automatically when a new project is made by the PI or webmaster.	This is used to identify a particular project within the project table.	Int	N/A	N/A
Domain ID	This is a unique ID number associated with each domain for the domain table.	This is created automatically when a new domain is created by the PI or webmaster.	This is used to identify a particular domain from the domain table.	Int	N/A	N/A
Project Name	This is the actual name or title of the project.	The PI will create the project name when creating the project.	This is used to quickly find a particular project from the table.	Varchar	N/A	N/A
Project Description	This will describe each individual project.	The PI or webmaster will create each description for each project.	Descriptions are used to inform users about a particular project.	Varchar	N/A	N/A
Principal Investigator	Each project will have a PI. This information must	The webmaster will enter the PI information.	This is used to identify who the PI is for a particular project.	Varchar	N/A	N/A

	go in the project table.					
Date Created	This will describe when a particular project is created.	This will be manually entered by a database manager	This is used to keep track of when a particular project was created	Int	N/A	N/A
Number of Users	This will describe how many users are assigned to a certain project.	This will automatically be generated each time a user is added.	This is used to keep track of how many users are assigned to each project.	Int	N/A	N/A

Solar Thermal Heat Transfer

Element	Description	How it is Set	How it is Used	Value Type	List of Discrete Values	Range
Date Online	This information displays the date that each solar panel goes online	This data will be entered manually by PI or webmaster	This data will help users know when a certain solar panel went online	Int	N/A	N/A
Energy Cells	This data will keep track of all of the energy cells involved with thermal heat transfer	This data will be entered manually by either the PI or database manager.	This data is used solely to keep track of the energy cells used for each project	Int	N/A	N/A
Location	Location data pertains to the location of each solar unit	This data is entered manually by the PI	Location is in the database in order for different users to know where the solar units are	Varchar	N/A	N/A
Number of Panels	This data portrays the amount of panels at STORC	PI's will enter this data manually	This data is used to show people at STORC the number of solar panels in use	Int	N/A	N/A
Panel Type	This will show users what type of solar panels being used for a particular project	PI's or database manager will manually create this data	This data is used to inform the user of the type of panel being used	Varchar	N/A	N/A

Project ID	This data is used to identify a particular project	PI's or database manager will enter this data manually when creating a project	This data is used to organize and identify the various projects related to solar heat transfer	Int	N/A	N/A
Station ID	This data is used to identify the different solar transfer stations	PI's or the database manager will create this data manually	This information's purpose is to inform the users of the different station identities. This will help users keep track of the different stations.	Int	N/A	N/A

Solar Power Data Point

Element	Description	How is it set	How is it used	Value Type	Discrete values	Range
Ambient Temperature	The local ambient atmospheric temperature	User input	To be able to do calculations that my require the outside temperature	Float	N/A	N/A
Datapoint ID	Number to distinguish solar power data entries	Automatically	Used to distinguish multiple solar power data entries	Int	N/A	N/A
Date	Date that the data point is recorded	Automatically	Used to specify date range for analytics	Date	N/A	1000-01-01 to 999-12-31
Kilowatts per Hour	Amount of energy consumed by STORC	User input	Used to track STORC sustainability. Contrasted against STORC energy produced	Float	N/A	N/A
Light Meter Reading	Measurement of amount of light hitting solar panel	User input	Used whenever widget references the value	Float	N/A	N/A
Station ID	Number to distinguish different stations	Automatically	Used to distinguish multiple stations	Int	N/A	N/A

Time	Time data point is recorded	Automatically	Used to specify time solar power data point is recorded	Time	N/A	-838:59:59 To 838:59:59

Worm Compost Bin

Element	Description	How it is Set	How it is Used	Value Type	List of Discrete Values	Range
Bin ID	This is used to identify the different worm bins on site.	This is automatically generated with each new bin added to the data table	Bin ID is used to identify each individual bin at STORC.	Int	N/A	N/A
Initial Number of Worms	This number represents the initial number of worms for a particular bin.	This will be manually entered by the database manager	This is used solely to keep track of the original number of worms in a bin.	Int	N/A	N/A
Location	This will describe where each bin is located at STORC.	This information will be entered manually by the database manager	This will be used periodically to notify users where each bin is	Varchar	N/A	N/A
Name	This will identify a name for each individual worm bin	This information is setup manually by the database manager	The bin name is used to identify each individual bin at STORC	Varchar	N/A	N/A
Project ID	This data is used to identify each worm bin project	This is manually entered by the database manager when creating a project	This set of data is used to identify each project associated with the worm bins	Int	N/A	N/A
Size	This data specifies the size of each worm bin	This is manually entered by either the webmaster or	This data is used to inform users how many gallons large	Float	N/A	N/A

		database manager	each worm bin is			
Volume Empty	This data shows the volume of the bin	This is manually entered when creating the project	This data is used to show the initial volume of the worm bin when they are empty	Float	N/A	N/A

Worm Bin Data Point

Element	Description	How is it set	How is it used	Value Type	Discrete Values	Range
Bed Moisture Concentration	Measurement of worm bin moisture	User input	Used in vermicomposting calculations	Float	N/A	N/A
Bed Temperature	Measurement of worm bin temperature	User input	Used in vermicomposting calculations	Float	N/A	N/A
Bin ID	Number to distinguish worm bins	User input	Used to distinguish multiple worm bins	Int	N/A	N/A
Datapoint ID	Number to distinguish data entries	Automatically	Used to distinguish multiple data entries	Int	N/A	N/A
Date	Date that the data point is recorded	Automatically	used to specify date range for analytics	Date	N/A	1000-01-01 to 999-12-31
Time	Time data point is recorded	Automatically	Used to specify time grow bed data point is recorded	Time	N/A	-838:59:59 To 838:59:59
Volume Produced	The volume of vermicomposting produced	user input	Used in vermicomposting calculations	Float	N/A	N/A

User Table

Element	Description	How it is Set	How it is Used	Value Type	List of Discrete Values	Range
First Name	The first name of a student.	PI will manually enter this data.	This data is used to identify a certain user.	Varchar	N/A	N/A
Last Name	The last name of a student.	PI will manually enter this data.	This data is used to identify a certain user.	Varchar	N/A	N/A
Phone Number	The phone number entered is associated with the individual student.	PI will manually enter this data.	This data will also be used to identify and contact users.	Varchar	N/A	N/A .
Profile Settings	This entails the organization and types of widgets in the dashboard.	Any user with access to the dashboard will be able to save their settings.	This will be used to save the way the dashboard looks for the user.	BLOB	N/A	N/A
User ID	Sacramento State Identification number will be attached to each student.	PI will manually enter this data.	This is another form of identification for the user.	Int	N/A	N/A
User Type	This will describe the type of access the user will have in the dashboard.	PI or admin will give them permissions to users	This is used to identify the type of access the user has in the dashboard.	Varchar	N/A	N/A

Data Tables

Table Name	Descriptions	How it is Set	How it is Used	Expected Growth of Records	Record Size in Bytes
Access List	Links a user to a STORC Project and sets their permissions	Set manually by an administrator	The permissions coupled with the User ID and Project ID limits each	The records a will grow and shrink each semester. There will be at most 60 people	12 bytes

			user to their list of projects		
Biodiesel Data Point	The daily activities that STORC employees undergo are recorded here	This data is all entered manually by STORC employees	This data is closely monitored by STORC users in order to measure the level of sustainability	The record of data points will constantly be growing as the number of projects increase	82 bytes
Biodiesel Station	Links users to a specific biodiesel station and project	Either the PI or webmaster will manually enter this data	This data is used to help STORC employees keep track of the different biodiesel stations	The record of data will grow as biodiesel projects are added and decrease as projects finish their course	54 bytes
Domain	Consists of all project types/domains	Entered manually by webmaster	Links specific projects to appropriate project domain	Expected rate of growth should be low	8034 bytes
Energy Consumption Data	This data describes how much energy STORC is pulling from the grid of Sacramento	This data will be automatically entered. After the servers record the information, the back end program will calculate energy consumption	Energy consumption data is used to give STORC employees an idea of their level of sustainability	Kilowatts per hour and cost per kilowatt per hour will fluctuate depending on STORC's activity.	38 bytes
Energy Consumption Data Point	The daily activities at STORC that relate to energy consumption are manually recorded	Any STORC user with correct access will be able to manually enter relevant data	This data is very important for monitoring the level of sustainability at STORC	The number of records for energy consumption will constantly grow	30 bytes
Fish Tank Data Point	All daily activities related to Fish tank stations will have data that needs to be	STORC employees will be manually entering in this data as part of their daily duties	The data points collected will be used to monitor the overall efficiency and	This number of records will grow quickly, but overtime will be compressed to	38 bytes

	entered in constantly		functionality of these stations	make room for new data	
Fish Tank	Links users to specific Fish Tank ID's	The PI or webmaster will manually enter this data	This is used to help STORC employees keep track of the different Fish tanks and the data that correlates with each one	This number of records will grow quickly, but overtime will be compressed to make room for new data	80 bytes
Grow Bed	This table will contain all data related to the grow bed stations	Some of this data, like soil temperature will be recorded automatically. Other data will have to be recorded manually.	This data will be used to monitor the development and health of the grow beds.	Depending on the number of grow beds active, the amount of data may either increase or decrease. Gradually the data should get larger but it is bound to fluctuate.	54 bytes
Grow Bed Data Point	All daily grow bed data is manually entered here	Date entered daily by STORC technician	The data points collected will be used to monitor the overall efficiency and functionality of these stations	Depending on the number of grow beds active, the amount of data may either increase or decrease. Gradually the data should get larger but it is bound to fluctuate.	38 bytes
Project	This table will store all of the ongoing projects, as well as previous projects that are no longer active.	PI's or webmasters will be entering this information manually for each project.	This is used to help all STORC users keep track of all current and past projects at STORC.	The number of records for projects will fluctuate. Sometimes the number of projects will increase, other	8054 bytes

				times it will decrease.	
Solar Power Data Point	All daily activities related to solar power are recorded in this table	STORC employees will be manually entering in this data as part of their daily duties	This data is used to calculate solar power analitics	This number of records will grow quickly, but overtime will be compressed to make room for new data	34 bytes
Solar Thermal Heat Transferor	This table will contain all data related thermal heat transfer from photovoltaic cells.	Most of this data, will be recorded automatically. Some of the data will have to recorded manually.	This data is used to quantify the functionality of the solar thermal heat transfer.	Depending on the weather and amount of solar panels functioning, the data will fluctuate.	96 bytes
Users	The STORC Employees that will use the system	All users will be manually entered and granted permissions by the administrator	This list will be used authenticate and grant access to the system	The records a will grow and shrink each semester. There will be at most 60 people	266 megabytes
Worm Bin Data Point	This table contains all of the data related to amount of compost produced by worms	STORC employees will be manually entering in this data as part of their daily duties	This data will be used to monitor the amount of worm by product produced over time	This data will be input on a regular basis since worms convert garbage into dirt	34 bytes
Worm Compost Bin	This table is in charge of holding all data related to worm composting.	STORC employees assigned to these stations will have to record some data manually. Other pieces of data will get recorded automatically.	This data will be used to observe functionality and productivity of the worm bins.	This data will be input on a regular basis since worms convert garbage into dirt	80 bytes

APPENDIX B – Use Case Modeling tutorial

UC:1 Manage Data

Use Case ID:	UC:1	Description:	Allows administrators and PIs to manage the database, print reports, and allows administrators or PI to accept or reject data from STORC Technicians for approval
Use Case Name:	Manage Data	Preconditions:	1. User must be logged in to the Dashboard. 2. User must have correct privileges to manage data
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. User should be able to pick an action item for data 2. Data has been edited, removed, or added.
Last Updated By:	Ashley	Normal Course:	1.0.0 Manage the Database 1.Input data into the Dashboard application. 2. Click the "Submit" button 3. The administrator or PI will approve the data 4. The data will be saved into the database 5. Entered data will be printed in a report
Date Created:	5/2/2015	Alternative Courses:	1.0.1 Edit Database 1. Data in the database was entered and submitted was incorrect. 2. User will change data in the database to the correct data 1.0.2 Data Enter was denied. 1. STORC Technician (Tech) submits data to Administrator or PI 2. Administrator or PI rejects their data 3. Message sent to STORC Tech explaining what is wrong with the entered data
Date Last Updated:	5/6/2015	Exceptions:	1.0.E 1. Data that has been approved will be updated in the database 2. Each project will have an PI and at least one administrator that can give permissions to other STORC Members
Actors:	Administrators, PI	Frequency of Use:	This will be used on a daily basis in order to keep track of all of the current project going on a STORC
Priority:	High	Special Requirements:	NA
Assumptions:	PI's will not have access to other PI's accounts at any time.	Notes and Issues:	Once an administrator or PI deletes data from the database the data is gone and can only be retrieved if it exists in a backup.

UC: 1-1 Print Report

Use Case ID:	UC:1-1	Description:	The Administrators or PI wishes to view a report summary for a project or for multiple projects.
Use Case Name:	Print Report	Preconditions:	1. User must be logged in to the Dashboard. 2. User must have correct privileges to print report
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. Downloads a PDF version of an overall report 2. User is able to view and print out the report
Last Updated By:	John Jones	Normal Course:	1.1 Print Report of project or overview of STORC 1. User goes to the project or overall view that they want the report from 2. User clicks on "View Report" button 3. Ask for information such as from start date to end date 4. Click "View Report" 5. Downloads PDF 6. Able to print report out
Date Created:	5/2/2015	Alternative Courses:	N/A
Date Last Updated:	5/8/2015	Exceptions:	1.1.O.E.1 No data in report 1. Click on report button 2. Reports back saying cannot create report because this project has no data
Actors:	Administrators, PI	Frequency of Use:	Once a week or month
Priority:	High	Special Requirements:	1. Document must be able to be saved and printed 2. Only the administrator user can print an overall report on STORC
Assumptions:	1. User wants all information on their report and just not selected data	Notes and Issues:	This is for their paper records and also reports that they can send out to individuals that want to see progress

UC: 1-2 Edit Existing Database Data

Use Case ID:	UC:1-2	Description:	Allows the Administrator or PI to delete data that is considered corrupt, or erroneous.
Use Case Name:	Edit Existing Database Data	Preconditions:	1. User has logged in 2. The user has Administrator or PI rights 3. Wrong data has been recorded into database
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. Data deleted from the database
Last Updated By:	David	Normal Course:	1.2 User selects the Manage Data option from the Dashboard 1. User finds data from faulty sensor or corrupt data 2. User highlights this data 3.

			User clicks delete button 4. Pop up asks user if they are sure they want to delete data 5. User click yes (alternative course 1.1) 6. The data is then deleted
Date Created:	5/2/2015	Alternative Courses:	1.2 User selects the Manage Data option from Dashboard (branch of 5) 1. User clicks no 6 Does not delete information from database
Date Last Updated:	5/8/2015	Exceptions:	1.2.O.E.1 User does not highlight any data on step 2 1. User clicks the delete button 2. Application pops up with error message saying "Please choose data you want to delete"
Actors:	Administrators, PI	Frequency of Use:	Low. Hopefully the sensors will not have frequent issues.
Priority:	High	Special Requirements:	1. PI can only delete data from their assigned project.
Assumptions:	1. Once they click yes they will not want the data back	Notes and Issues:	If they want data back they may not be able to retrieve it unless it has been backed up

UC: 1-3 Accept/Deny Inputs Waiting for Approval

Use Case ID:	UC:1-3	Description:	Allows the administrators and PI's to confirm the work of the STORC Technicians before the collected data is stored into the database
Use Case Name:	Accept/Deny Inputs Waiting for Approval	Preconditions:	1. Student must have logged in and submitted data to be approved. 2. Administrator or PI must login 3. The PI or administrator needs to look at pending data waiting for their approval.
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. Upon approval the data will be properly sent to the database and stored in the correct table
Last Updated By:	John	Normal Course:	1.3.0 1. A PI logins into the dashboard 2. They look at all of the pending data for their project 3. They approve the data and it is then stored in a database
Date Created:	5/2/2015	Alternative Courses:	1.3.1.0 An administrator logins in to the dashboard 2. They look at all of the pending data for their project 3. They accept the data and it is then stored in a database
Date Last Updated:	5/8/2015	Exceptions:	1.3.E.0 1. An administrator or PI logins into the dashboard 2. They look at all of the pending data for their project 3. They reject the data 4. A message is sent back to the STORC Tech requesting a change in the data that was input.

Actors:	Administrators, PI	Frequency of Use:	1.3.2.0 Daily to weekly
Priority:	High	Special Requirements:	1.It is required that the submission form for the STORC Technician is not blank
Assumptions:	1.We are assuming that the PI or the administrators will check the their projects on the dashboard on a regular basis	Notes and Issues:	If a PI or administrator rejects a STORC Technician submission by mistake, the technician must resubmit their data in order for the PI to approve the data and send it to the database

UC: 2 Manage Users

Use Case ID:	UC:2	Description:	Allows Administrators and PI to add, delete, or change users permissions
Use Case Name:	Manage Users	Preconditions:	1. An administrator must log into the system. 2. The person the administrator is adding must be in the CSUS system
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. Once user added they will be able to access relevant STORC Dashboard and their projects
Last Updated By:	Ashley	Normal Course:	2.0 Manage Users for Dashboard 1. Varies depending on the action that is being done
Date Created:	5/2/2015	Alternative Courses:	N/A
Date Last Updated:	5/8/2015	Exceptions:	2.0.E 1.PIs will not be able to manage administrator users
Actors:	Administrators, PI	Frequency of Use:	Rarely
Priority:	High	Special Requirements:	Administrator is allowed to add PI, technicians, and webmaster. PI can only add technicians
Assumptions:	The webmaster and technicians can't add other users	Notes and Issues:	N/A

UC: 2-1 Add Users

Use Case ID:	UC:2-1	Description:	Allows Administrators and PI to add other users to project to work on a project.
Use Case Name:	Add Users	Preconditions:	1. An administrator needs to login to add a PI 2. An administrator or PI must be able to assign others to a project

Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. Once user added they will be able to access the STORC Dashboard and their projects
Last Updated By:	David	Normal Course:	2.1.0 1. An administrator logs in and navigates to a project page. 2. The administrator looks up a person's username from CSS 3. The administrator adds a PI to a project.
Date Created:	5/2/2015	Alternative Courses:	2.1.1 1.A PI logs in and navigates to a project page. 2. The PI looks up a person's username from CSS 3. The PI adds a STORC Technician to a project. 2.1.2 1. An administrator logs in and navigates to a project page. 2. The administrator looks up a person's username from CSS 3. The administrator adds a STORC Technician to a project.
Date Last Updated:	5/8/2015	Exceptions:	2.1.E PI's may not add other PI's. An administrator is needed to add a PI.
Actors:	Administrators, PI	Frequency of Use:	This will be used when a new project is added to STORC Dashboard Project, or a PI, administrator, or a STORC Technician begins or finishes working on a project
Priority:	High	Special Requirements:	1. An administrator must always be assigned to a project in order to add other users to the project
Assumptions:	1. It is assumed that all projects have at least one user and if there is only one user it must be an administrator	Notes and Issues:	If no users are assigned to a project there will not be a way to add users to a project

UC: 2-2 Change Permissions

Use Case ID:	UC:2-2	Description:	Changes the permissions of an administrator, PI, or Student Technician in order to work on other projects within STORC
Use Case Name:	Change Permissions	Preconditions:	1. The user must exist in order to change their permissions
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. User permissions changed
Last Updated By:	John	Normal Course:	2.2.0. An administrator logs in 2. The administrator adds a PI or STORC Technician to one or several project.

Date Created:	5/2/2015	Alternative Courses:	2.2.1. A PI logins in 2. The PI adds a STORC Technician to one or several project.
Date Last Updated:	5/8/2015	Exceptions:	N/A
Actors:	Administrators, PI	Frequency of Use:	This will not happen on a regular basis. It will be utilized as needed
Priority:	High	Special Requirements:	A PI can not give themselves permissions to other projects or give other PI's access to other project they themselves do not have permission for
Assumptions:	A person will never have more than one type of access permissions	Notes and Issues:	If permissions are not set correctly access to the data can not be accessed or inputted into the database casing loss of information and time

UC: 2-3 Delete Users

Use Case ID:	UC:2-3	Description:	Allows Administrator and PIs to delete users from the application.
Use Case Name:	Delete Users	Preconditions:	1. Must know which users do not have business need.
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. That user will have only general public access to the Dashboard.
Last Updated By:	Ashley	Normal Course:	2.3 Delete User (branch after step 3) 1. From user list click on user you want deleted 2. Hit the "Delete" Button 3. Will ask "are you sure you want to delete user <user ID>" 4. click yes 5. User is now deleted.
Date Created:	5/2/2015	Alternative Courses:	2.3.1 Delete User (Step 4) 1. User click no 5. User will still have access.
Date Last Updated:	5/8/2015	Exceptions:	N/A
Actors:	Administrators, PI	Frequency of Use:	Usually once at the beginning and end of each semester.
Priority:	High	Special Requirements:	PI can only delete users in their projects. Administrator can delete anybody.
Assumptions:	No other users can delete.	Notes and Issues:	N/A

UC: 3 Input Data

Use Case ID:	UC:3	Description:	Allows users to submit data for submission.

Use Case Name:	Input Data	Preconditions:	1. User must have data to input.
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1.Data sent to PI for approval.
Last Updated By:	David	Normal Course:	3.0 Input Data life cycle. 1. User chooses data input categories. 2. User inputs data. 3. System checks if data correct (alternative course 3.1) 4. User submits for approval. 5. PI accepts data (alternative course 3.2) 6. data inputted into database.
Date Created:	5/2/2015	Alternative Courses:	3.1 Input Data Life cycle data - incorrect (at step 3) 1. Systems informs user of incorrect data 2. User must re-enter the data into input form. 3. User submits data for approval. 5. PI accepts data (alternative course 3.2) 6. data input into database 3.2 Input Data Life cycle data incorrect PI (at step 5) 1. PI declines data 2. user must re-enter or recollect data 3. user continues to normal course.
Date Last Updated:	4/8/2015	Exceptions:	3.O.E.1 No data 1. If no data is entered, no submission is made.
Actors:	PI, Technicians	Frequency of Use:	Daily-Weekly
Priority:	High	Special Requirements:	PI are the only ones allowed to approve that data. technicians can only input.
Assumptions:	N/A	Notes and Issues:	N/A

UC:3-1 Manually Input Data

Use Case ID:	UC:3-1	Description:	Allows user to manually input data into sections that cannot be measured by sensors.
Use Case Name:	Manually Input Data	Preconditions:	1. The user must login 2. Must have data they need to enter from there project task they just did
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. user will have data sent for approval
Last Updated By:	John	Normal Course:	3.1.0 Manually Input Data 1. User will choose which data set they are inputting data into 2. They will then enter their data from the task

			they just did 3. User will then submit data to PI (alternative course 3.1.1)
Date Created:	5/2/2015	Alternative Courses:	3.1.1 Manually Input Data System does not like (branch step 3) 1. System returns with data error 2. Student resubmits the fixed data 3. Data is then sent to PI
Date Last Updated:	5/8/2015	Exceptions:	N/A
Actors:	PI, Technicians	Frequency of Use:	More than once a day
Priority:	High	Special Requirements:	System must check for valid data and PI thus making sure data is correct
Assumptions:	Data can be integers, floats, double, boolean, dates, or strings	Notes and Issues:	N/A

UC: 3-2 Correct Mistakes

Use Case ID:	UC:3-2	Description:	Allows a PI to reject the data and request that the technician take another look at the data and resubmit their data.
Use Case Name:	Correct Mistakes	Preconditions:	1. The PI must login. 2. The PI examines the data and determines that the data does not support what is actually happening.
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. The PI must look over the data after second submission to gauge its validity.
Last Updated By:	Ashley	Normal Course:	3.2.0 1.The PI will look at the data and determine if that data seems correct 2. The PI will reject the data which sends a notification to the technician 3. The technician fixes the mistake(s) and resubmits the data for approval.
Date Created:	5/2/2015	Alternative Courses:	3.2.1 1. The PI accidently accepted data that was not within reason 2. The PI changes the values within a table in the database.
Date Last Updated:	5/8/2015	Exceptions:	3.2.E 1. If the PI finds one mistake the data can be approved and the PI can go into the database and fix any minor mistake without rejecting the whole submission
Actors:	PI, Technicians	Frequency of Use:	This will be used occasionally when mistakes are made.

Priority:	High	Special Requirements:	1. Technicians will not be allowed direct access to the database
Assumptions:	1.The Technicians will not be allowed change data once submitted	Notes and Issues:	PI 's will have access to the database so they can change data that is incorrect

UC: 3-3 Submit Input for Approval

Use Case ID:	UC:3-3	Description:	Allows Technician to submit input for approval by PI.
Use Case Name:	Submit Input for Approval	Preconditions:	1. Technician has inputted data from their STORC job task.
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. PI approves or rejects the data 2. if approved, data submitted to database 3. if rejected technician must redo data.
Last Updated By:	Ashley	Normal Course:	3.3.0 Submitting Input for approval 1. Technician clicks the submit button for data after it has been checked 2. Lets user know that their data has been submitted for approval.
Date Created:	5/2/2015	Alternative Courses:	3.3.1 Submitting Input for reapproval 1. Technician fixes data that was rejected 2. Presses the submit button 3. lets user know that their data has been submitted for approval
Date Last Updated:	4/8/2015	Exceptions:	N/A
Actors:	Technicians	Frequency of Use:	more than once a day
Priority:	High	Special Requirements:	PI if they input data does not have to get sent for approval.
Assumptions:	Technicians are the only user who goes through this process.	Notes and Issues:	N/A

UC: 4 Customize Dashboard

Use Case ID:	UC:4	Description:	Allows a user to customize their dashboard.
Use Case Name:	Customize Dashboard	Preconditions:	1. User does not like layout of the default dashboard or data being shown.
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. Dashboard will reflect new changes.

Last Updated By:	John	Normal Course:	4.0 Customize Dashboard 1. User can edit their dashboard how they feel with new, resized, or move widgets 2. User will click save to keep changes.
Date Created:	5/2/2015	Alternative Courses:	4.1 Customize Dashboard 1. User customizes dashboard 2. They do not like it and hit cancel. Dashboard reverts to last save state 4.2 Customize Dashboard back default 1. User customizes dashboard 2. They don't like it or their old settings. User hits default button. Dashboard reverts to defaults.
Date Last Updated:	5/8/2015	Exceptions:	4.0.E.1 Customize Dashboard not saved for public 1. Public can customize their dashboard with new, resized, or move widgets 2. Public cannot save their dashboard. Dashboard will always be Global Default View for public users.
Actors:	Administrators, PI, Technician, webmaster, public	Frequency of Use:	Once a week or month.
Priority:	High	Special Requirements:	N/A
Assumptions:	all users have same default screen.	Notes and Issues:	N/A

UC: 4-1 Edit Widget

Use Case ID:	UC:4-1	Description:	Allows a user to change the attributes of a widget
Use Case Name:	Edit Widget	Preconditions:	1. Widget must already exist
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. Widget will automatically update the existing widget with the new settings.
Last Updated By:	Ashley	Normal Course:	4.1.0 Edit Widget data and type 1. user right clicks on widget 2. User chooses "edit widget" 3. new screen pops up 4. user chooses widget type 5. ask user possibly for how many inputs 6. user chooses data to be used in this widget 7. User hits okay 8. widget changes to what user wants
Date Created:	5/2/2015	Alternative Courses:	4.1.1 Edit Widget data and type 1. user right clicks on widget 2. User chooses "edit widget" 3. new screen pops up 4. user hits cancel at any time in process 5. Will go back to old widget

Date Last Updated:	5/8/2015	Exceptions:	N/A
Actors:	Administrators, PI, Technicians, Webmaster, Public	Frequency of Use:	used by multiple users everyday
Priority:	High	Special Requirements:	N/A
Assumptions:	User wants to change the entire widget	Notes and Issues:	N/A

UC: 4-2 Modify Global Default View

Use Case ID:	UC:4-2	Description:	Allows a user to modify the current global default view.
Use Case Name:	Modify Global Default View	Preconditions:	1. Default view has already been set
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. Global Default View modified.
Last Updated By:	David	Normal Course:	4.2.0 Modify Global Default view 1. Webmaster clicks on edit default view for that project 2. Webmaster arranges the widgets to location, sizes, widget type, and type of data
Date Created:	5/2/2015	Alternative Courses:	4.2.1 Modify Global Default view 1. Webmaster clicks on edit default view for that project 2. Webmaster arranges the widgets to location, sizes, widget type, and type of data 3. Cancels the modification
Date Last Updated:	5/8/2015	Exceptions:	NA
Actors:	Webmaster	Frequency of Use:	when the director or PI feels it needs to be updated
Priority:	High	Special Requirements:	N/A
Assumptions:	The PI or administrator will not/does not want to edit global view	Notes and Issues:	N/A

UC: 4-3 Create New Tab

Use Case ID:	UC:4-3	Description:	Allows a user to create a new tab on the Dashboard.

Use Case Name:	Create New Tab	Preconditions:	1. User wants to see certain data from their multiple projects
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. A new blank tab exists for the user to populate with widgets.
Last Updated By:	John	Normal Course:	4.3.0 Create a new tab to see other data 1. Click on the + sign in the upper left hand corner 2. Choose a name for that tab 3. User creates new widgets in the new tab.
Date Created:	5/2/2015	Alternative Courses:	NA
Date Last Updated:	5/8/2015	Exceptions:	NA
Actors:	Administrators, PI, Technicians, Webmaster	Frequency of Use:	Intermittent. Weekly or monthly.
Priority:	High	Special Requirements:	N/A
Assumptions:	N/A	Notes and Issues:	N/A

UC: 4-4 Save Global Default View

Use Case ID:	UC:4-4	Description:	Allow an Administrator or Webmaster to save the Global Default View to the database. This will be the view the Public and new users see when they first set up their dashboards.
Use Case Name:	Save Global Default View	Preconditions:	1. User must be logged in. 2. The user must be able to connect to the server in order to submit the change.
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. Global Default View changed.
Last Updated By:	Ashley	Normal Course:	4.4.0 1.The webmaster will create a new view 2.The view will be reviewed and editing will occur 3.The view will be stored in the server 4. The public will see this new view as soon as it is saved to the server.
Date Created:	5/2/2015	Alternative Courses:	4.4.1 1.Both the PI or an Administrator will be able to update the Global Default View.
Date Last Updated:	5/8/2015	Exceptions:	N/A

Actors:	Administrators, PI, Webmasters	Frequency of Use:	The webpage will be updated depending on the Sponsor's needs or wants.
Priority:	High	Special Requirements:	N/A
Assumptions:	1. It is assumed that the Webmaster knows how to edit the dashboard widgets.	Notes and Issues	This view will affect the view of the public instantly.

UC: 4-5 Reset to Global Default View

Use Case ID:	UC:4-5	Description:	Allows the user to reset their current view to the default view.
Use Case Name:	Reset to Global Default View	Preconditions:	1. Must have edited their page in some way.
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	2. Dashboard set to default view.
Last Updated By:	David	Normal Course:	4.5.0 Reset default view 1. User clicks button "Reset to Default View". 2. User prompted for verification. 3. User clicks yes. 4. Dashboard set to default view.
Date Created:	5/2/2015	Alternative Courses:	4.5.1 Reset default view. 1. User clicks button "reset to default view" 2. User prompted for verification. 3. User clicks no. 4. Current view unchanged.
Date Last Updated:	5/8/2015	Exceptions:	NA
Actors:	Administrators, PI, webmaster, technicians, public	Frequency of Use:	Intermittent
Priority:	High	Special Requirements:	There is always a default view. Public will not be able to save views.
Assumptions:	Users want to save multiple views.	Notes and Issues:	N/A

UC: 4-6 Create Widget

Use Case ID:	UC:4-6	Description:	Allows the user to create a new widget.
Use Case Name:	Create Widget	Preconditions:	1. The user must be logged into the database to save their modifications.
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. The dashboard will show have the newly created widget for that user.

Last Updated By:	John	Normal Course:	4.6.0 1.The users will create the widget by following a linear process 2.Once the widget has been created it will show up on the user's dashboard.
Date Created:	5/2/2015	Alternative Courses:	4.6.1 1.The user can being the process of creating a widget and finish it at a later time 2.Once the user logs in the next time they can finish customizing the widget 3.Once the widget if finished it will show upon the user's dashboard.
Date Last Updated:	5/8/2015	Exceptions:	4.6.E 1.The public will not be able to save the layout of their dashboard 2.Users that can save their layout must complete the widget building process before it will be saved on their dashboard.
Actors:	Administrators, PI, Webmaster, Technicians, Public	Frequency of Use:	This will be used anytime a user would like to make a new widget, an often occurrence.
Priority:	High	Special Requirements:	N/A
Assumptions:	1. The user will be able follow the linear setup process.	Notes and Issues:	1. The project may lose the configurations of a widget when the user logs out.

UC: 4-7 Move/Resize Widget

Use Case ID:	UC:4-7	Description:	Allows user to move and resize a widget on the STORC Dashboard.
Use Case Name:	Move/Resize Widget	Preconditions:	1. Widgets must exist.
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. Widget will have a new location or size.
Last Updated By:	Ashley	Normal Course:	4.7.0 Move and/or resize widget 1. click on widget want to edit 2. Move widget around the dashboard 3. Place in location on the dashboard.
Date Created:	5/2/2015	Alternative Courses:	4.7.1 Move and/or resize widget 1. click on widget want to edit 2. Go to the corner of the widget and drag in or out to make bigger or smaller 3. Let go of the object.
Date Last Updated:	5/8/2015	Exceptions:	N/A

Actors:	Administrators, PI, technicians, webmaster, public	Frequency of Use:	Daily-Weekly
Priority:	High	Special Requirements:	N/A
Assumptions:	NA	Notes and Issues:	N/A

UC: 4-8 Delete Widget

Use Case Name:	Delete Widget	Preconditions:	1. Widget exists. User no longer has a need for widget.
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. The widget will no longer exist on users dashboard
Last Updated By:	David	Normal Course:	4.8.0 Delete Widget 1. User clicks on widget 2. User then presses "x" that appears in the upper right hand corner 3. User prompted for delete verification. 4. user says yes 5. Widget is removed.
Date Created:	5/2/2015	Alternative Courses:	4.8.1 Delete Widget Mistake 1. user clicks on widget 2. User then presses "x" that appears in the upper right hand corner 3. User prompted for delete verification. 4. User selects no 5. User returned to dashboard. Widget still exists.
Date Last Updated:	5/8/2015	Exceptions:	N/A
Actors:	Administrators, PI, technician, webmaster, public	Frequency of Use:	Daily-Weekly
Priority:	High	Special Requirements:	If widget is part of the default view, the widget will reappear if the user resets to default.
Assumptions:	Confirmation is needed as they may accidentally click the "x"	Notes and Issues:	N/A

UC: 5 Login

Use Case ID:	UC:5	Description:	Users login to employees login or click on guest login link

Use Case Name:	Login	Preconditions:	1. Go to STORC Dashboard site 2. Login SacLink account must have been added to user list
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. The user will be able to view and edit the STORC Dashboard
Last Updated By:	John	Normal Course:	5.0 Login to Dashboard 1. User will click on employee login in button 2. They will input their Sac State login username 3. User will put in their Sac State password 4. User will click submit 5. If the username and password are correct the user will be
Date Created:	5/2/2015	Alternative Courses:	5.1 Login to Dashboard Login incorrect 1. Will have to re enter username 2. Reenter password 3. Click submit 4. will login into the dashboard if information correct 5.2 Login to Dashboard Public 1. User is the public clicks on general login 2. brings them to generic dashboard
Date Last Updated:	4/8/2015	Exceptions:	5.0.E.1. Public tries to Login to dashboard 1. Public clicks on employee login 2. enters there sac state information 3. tells them to login to public
Actors:	Administrators, PI, Technician, Webmaster, Public	Frequency of Use:	multiple times a day
Priority:	High	Special Requirements:	Guest will just have button they click which shows them STORC dashboard. Otherwise employee login must have had username added
Assumptions:	Will be able to get IRT on board to provide login service	Notes and Issues:	N/A

UC: 5-1 Employee Login

Use Case ID:	UC:5-1	Description:	Employees are able to login to dashboard
Use Case Name:	Employee Login	Preconditions:	1. go to STORC dashboard site 2. to officially login saclink account must have been added to user list
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	1. will be able to view and edit STORC dashboard
Last Updated By:	Ashley	Normal Course:	5.1 Login to Dashboard 1. User will click on employee login in button 2. they will input their Sac State login username 3. User will put

			in Sac State password 4. User will click submit 5. will login them into system if credentials are not correct
Date Created:	5/2/2015	Alternative Courses:	5.1.1 Login to Dashboard Login incorrect 1. Will have to re enter username 2. Reenter password 3. Click submit 4. will login into the dashboard if information correct
Date Last Updated:	5/8/2015	Exceptions:	N/A
Actors:	Administrators, PI, Technicians, Webmaster	Frequency of Use:	multiple times a day
Priority:	High	Special Requirements:	Employee login must have had username added
Assumptions:	Will be able to get IRT on board to provide login service	Note and Issues	5.1 Log in to Dashboard 1. User will click on employee login in button 2. they will input their Sac State login username 3. User will put in Sac State password 4. User will click submit 5. will login them inot system if credtioals are not correct

UC: 5-2 Guest Login

Use Case ID:	UC:5-2	Description:	Portal for public to access dashboard
Use Case Name:	Guest Login	Preconditions:	1. User must navigate to website
Created By:	John Jones, David Grapentine, Ashley Gregory	Postconditions:	2. public will be able to view STORC information
Last Updated By:	David	Normal Course:	5.2 Login to Dashboard Public 1. User is the public clicks on general login 2. brings them to generic dashboard
Date Created:	5/2/2015	Alternative Courses:	5.2.1 Public knows website for Dashboard 1. user types in website for public dashboard 2. automatically puts them on page
Date Last Updated:	5/8/2015	Exceptions:	5.2.E.1. Public tries to log in to dashboard 1. Public clicks on employee login 2. enters their sac state information 3. tells them to login to public
Actors:	public	Frequency of Use:	more than once a day
Priority:	High	Special Requirements:	Guest will just have button they click which shows them STORC dashboard.

Assumptions:	No information will have to be gathered from user	Notes and Issues:	N/A